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Common Buzzard nests

The Cayman Islands

Common Swifts

British Birds

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Front-cover photograph: Common Buzzard *Buteo buteo*, Warwickshire, February 2013. *Mike Lane*

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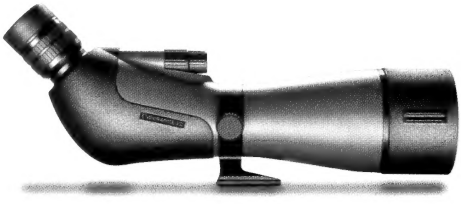

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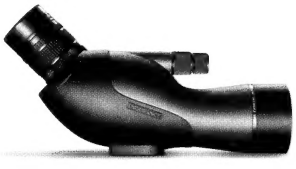

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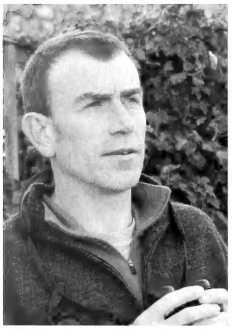

This month's article on the Common Buzzard is the third contribution on this species by Robin Prytherch in eight years, as he concentrates on writing up a lifetime of spare-time study effort. Robin is well known to me as one of the original gang of five that saved *BB* in 2000, when the magazine was on its knees. In those days, Robin and the rest of the team all seemed rather senior gentlemen to me, and I would have been most impressed had I realised at the time that Robin – even then in his sixties – was still hauling up and down some very large trees and climbing to improbably remote Buzzard nests. He confessed recently that he does now shudder to think of what he used to do. But the data, painstakingly collected, are no doubt now a source of great satisfaction to mitigate the cold sweats. The spread of the Common Buzzard, which Robin showed so graphically in his last paper (*Brit. Birds* 106: 264–279), is something that still surprises me every time I visit old haunts in eastern England.

After another instalment of *BB*'s series on the UK Overseas Territories, there are a couple of insightful papers on the Common Swift. For anyone living in our towns and cities, the first sight of Swifts in the skies above home or the workplace is surely one of the most uplifting markers of the passing spring – or at least that's how I felt when I lived in a city. Christian Neumann's simple but revealing observations in the centre of Berlin are a good reminder that urban ornithology can be very rewarding.

Roger Riddington

***British Birds* aims to:** ❖ provide an up-to-date magazine for everyone interested in the birds of the Western Palearctic; ❖ publish a range of material on behaviour, conservation, distribution, ecology, identification, movements, status and taxonomy as well as the latest ornithological news and book reviews; ❖ maintain its position as the journal of record; and ❖ interpret scientific research on birds in an easily accessible way.

BB eye

Birds, discards and decision-making

Fish discards are big news. On average, some 8% (6.8 million tonnes) of the total catch by weight of marine organisms caught by fishing boats worldwide are discarded every year, of which about 1.3 million tonnes are discarded in the fisheries of the northeast Atlantic, mostly in European Union (EU) waters (Kelleher 2005).

What are discards? Put simply, discards are an unwanted catch. They could be fish that are of no commercial value, fish that are below the legal landing size, fish for which a vessel has no quota (or for which their quota share has run out), damaged or spoiled fish, or other organisms of no value. The EU has been concerned about discarding for years and while attempts have been made to reduce discarding through technical measures such as mesh-size regulations, restricted fishing practices and regulated areas, these have been largely unsuccessful.

The public perception is that discards are a waste of an important resource and that view was fuelled by the campaign led by celebrity chef Hugh Fearnley-Whittingstall. 'Hugh's Big Fish Fight' generated a high public profile for the issue and over 870,000 people signed 'Fish Fight's' petition to end the practice of discarding. The emotive images of large quantities of perfectly edible fish, of legal size, being thrown overboard, accompanied by a commentary that fishermen are being forced to dump fish because of EU rules, certainly reinforces the perception of waste (even though discarding was taking place long before there were any EU rules).

Nonetheless, one provision in the 2013 reform of the EU's Common Fisheries Policy (Regulation no. 1380/2013), which came into force on 1st January 2014, was an obligation to land *all* catches of certain fish species from 1st January 2015. Furthermore, by 2019 all European fishing vessels will be obliged to land nearly all of the fish they catch. It seems that the decision to introduce the discard ban can be largely attributed to the weight of public opinion of discarding; in fact, Fish Fight was cited by the European Commission (EC) as a key factor in the reform process.

Banning discarding is potentially a double-edged sword, however. The ban will undoubtedly satisfy Fish Fight supporters but it brings with it a host of complex problems relating to implementation, monitoring and enforcement. In addition, the potential environmental impacts are not well understood and, compared with the perception of discards being wasteful, those impacts appear not to have played a major role in the decision to ban discarding. In fact, with regard to the potential impact on seabird populations, the EC's impact assessment report on policies to reduce discarding (EC 2010) contains not a single reference to seabirds. So how are seabirds likely to be affected?

Anyone who has been to sea on or near a fishing boat will have seen the massed assemblages of seabirds that congregate at the stern of the boat to feast on the waste (fish, offal and other organisms) thrown overboard. Garthe *et al.* (1996) estimated that in the North Sea alone, the total amount of fishery waste each year is 62,800 t of offal, 262,200 t of roundfish, 299,300 t of flatfish, 15,000 t of elasmobranchs and 149,700 t of benthic invertebrates, representing 4% of the total biomass of fish and 22% of the total landings. They also estimated that the number of seabirds potentially supported by fishery waste in the North Sea was roughly 5.9 million individuals and that the mass of discards and offal consumed by birds during their study amounted to 55,000 t of offal, 206,000 t of roundfish, 38,000 t of flatfish, 2,000 t of elasmobranchs and 9,000 t of benthic invertebrates. Extrapolating such numbers to all EU waters amounts to rather a lot of discarded fish. From a societal perspective, discarding is intuitively wasteful but fish discards provide food for many other species including scavengers such as Great Skuas *Stercorarius skua* and large gulls, which have come to rely on discards as a major food source. In some sea areas, Northern Gannets *Morus bassanus* are also frequent scavengers of discarded fish, especially pelagic species

such as herring and mackerel. A study on Grassholm, in Pembrokeshire, showed that 42% of Gannets regularly targeted fishing vessels, as well as searching for naturally occurring prey; 81% of male Gannets and 30% of females used fishing vessels as a source of food (Bicknell *et al.* 2013).

Although the supply of offal discarded from fishing vessels will continue under the landing obligation (LO), the reduction of fish discards represents a large decrease in the food supply to seabirds. Bicknell *et al.* (2013) noted that the EU ban on fish discards could have a significant short-term impact on some seabird populations, and also pointed out that some threatened species may be affected – for example, the Critically Endangered Balearic Shearwater *Puffinus mauretanicus* makes significant use of discards. Votier *et al.* (2004) showed that reduced rates of discarding, particularly when coupled with decreased availability of small shoaling pelagic fish such as sandeels, result in an increase in predation by Great Skuas on other birds, which in turn can represent a potentially serious threat to some seabird communities.

Whether populations of scavenging seabirds will be significantly affected by the ban on discarding is hard to predict, but current scientific thinking is that because they are opportunistic feeders, they will most likely be able to switch to other sources of food, which may result in increased predation on other seabird species.

The LO is intended to eliminate almost all discarding and to encourage changes in fishing practices so that unwanted catches are not taken in the first place. Even though the potential environmental impacts of the LO were not fully addressed in the EC's Impact Assessment, it seems that if the ban on discarding is implemented successfully, the net result will be a reduced supply of certain fish species to scavenging seabirds, but that may not be a wholly bad thing. Heath *et al.* (2014) showed that landing the entire catch while fishing as usual has conservation penalties for seabirds, marine mammals and seabed fauna, and no benefit to fish stocks; whereas if implementation of the obligation to land all catches gives rise to changes in fishing practices that limit the capture of unwanted fish, then birds, mammals and most fish stocks will actually benefit. Consequently, even though the EU's decision to ban discarding was taken in response to the weight of public opinion generated through Fish Fight – and without a proper assessment of the potential environmental impacts – if it works as intended, the overall impact on seabirds might actually be a positive one.

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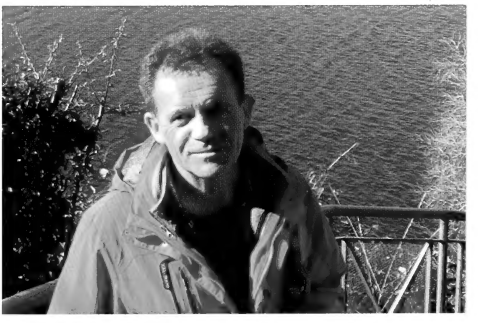
John Casey



John Casey currently works as a Senior Research Fellow in the Maritime Affairs Unit[1] of the EC's Joint Research Centre, and is a former Chair of the EC's Scientific, Technical and Economic Committee for Fisheries.

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News and comment

Compiled by Adrian Pitches

Opinions expressed in this feature are not necessarily those of *British Birds*

Białowieża Forest threatened by huge increase in logging

It's the most extensive remnant of primeval forest in Europe – but Poland's forestry minister has agreed plans for a three-fold increase in logging of the unique Białowieża Forest under the pretext of combating the Spruce Bark Beetle *Ips typographus*.

Białowieża is all that remains of the lowland forest which once covered most of Europe. Its breeding bird populations – including five owls, ten woodpeckers and four flycatchers – are internationally important, and its exceptional species richness was highlighted in a *BB* review article by Ludwik Tomiałojć and Tomasz Wesołowski (*Brit. Birds* 98: 174–193); http://bit.ly/20BDI5y

The Polish portion of Białowieża has been declared a UNESCO Biosphere Reserve and has been designated under EU Directives as a Natura 2000 site. But only a third of the Forest is strictly protected.

Białowieża is a remarkable place, unquestionably one of Europe's greatest wildlife sites, yet the new Minister of the Environment, Jan Szyszko, has approved a plan by the State Forest Administration to more than triple the amount of timber acquired from Białowieża, to over 180,000 cubic metres in the next decade. The justification for this controversial decision is combating a 'plague' of the Spruce Bark Beetle. According to foresters, the beetle can be brought under control only by felling trees – mainly spruces, but they claim that the logging plans should include other tree species as well, in order to guarantee their health.

Desmond Dugan/FLPA

139. Grey-headed Woodpecker *Picus canus*, Białowieża Forest, February 2011.

The Minister has ignored the protests of leading Polish biologists, the State Council for the Conservation of Nature and the Scientific Council of the Białowieża National Park. He has also rejected the views of the largest nature conservation organisations in Poland as well as the Polish people, more than 150,000 of whom signed a petition in protest against the planned logging operations. Equally ineffective was a letter from the European Commission stating unequivocally that any increase in logging in the Białowieża Forest would constitute a threat to priority habitats and species and would therefore be at odds with European environmental law.

You can read more and sign a petition against the logging plans at www.ilove bialowieza.com

And a timely ecotourism piece about this eastern Eden is on the *Guardian* Travel pages http://bit.ly/1SvDZB6

Higher risk to swans from lead poisoning

The health of Britain's swans is being affected by lead poisoning at lower doses than previously recognised. This suggestion comes from new research by the Wildfowl & Wetlands Trust (WWT) and the University of Exeter. The study, published in *Environmental Pollution*, investigated levels of lead in the bloodstream and found they were related to reduced body condition of

Whooper Swans *Cygnus cygnus*.

The swans' body weight is critical for getting them through the winter, and into condition to migrate back to Iceland in the spring and then breed successfully. Some 260 Whooper Swans were caught and tested by WWT in Lancashire and Dumfries & Galloway. The study found significantly lower body condition in birds whose blood lead level was above 44 micrograms per decilitre – lower than previously recognised thresholds of 50–100 micrograms per decilitre.

Some 10% of the swans in the study had lead levels above those associated with significant loss of condition. The study shows how sensitive birds can be to lead poisoning as health effects can be seen at even relatively low levels of this toxic substance. Apparently healthy swans may in fact be suffering from the effects of lead poisoning.

The swans are exposed to lead by eating spent shot, left on the ground after shooting, which they mistake for food or grit. A classic symptom of lead poisoning is paralysis of the gut making digestion of food ineffective and leading to loss of weight and energy reserves.

WWT Senior Ecosystem Health Officer Julia Newth said: 'We know from this and previous studies that a high proportion of Whooper Swans are affected by lead poisoning in the UK. Perhaps we shouldn't be surprised to find negative impacts at lower lead levels than previously thought as global research on a range of species recognises that there is no such thing as a safe level of lead.'

Professor of Animal Ecology at the University of Exeter Stuart Bearhop said: 'This new scientific study provides important evidence that the exposure of British birds to toxic lead isn't just a matter of how many might die. Others may be weakened by lead poisoning, and these health effects will almost always be invisible to the casual observer.

'It is clear we need to find additional ways to reduce the risk of wildlife exposure to toxic heavy metals by initiating best practice and changing the types of shot used in the countryside.'

The Whooper Swans were caught at Martin Mere in Lancashire and Caerlaverock in Dumfries & Galloway during the winters of 2010/11, 2012/13 and 2013/14. Six of the seven catches were made very late in the season, between mid February and early March, with the seventh in mid December. This ensured that their blood lead levels most likely reflected their diet while overwintering in Britain, rather than residual levels from feeding in Iceland the summer before – lead works its way through the bloodstream and then the level drops after around 35 days as it is deposited in other body tissues.

Partial restrictions on use of lead were introduced in England in 1999 and Scotland in 2004 due to growing concerns about birds being poisoned by spent lead ammunition. It is illegal to shoot lead over the wetlands around both WWT's test sites in England and Scotland, while in England it's also illegal to use lead to shoot certain species. But WWT testing in the winter of 2013/14 showed that 77% of 102 ducks sold as being locally shot in England were still shot illegally using lead rather than an alternative non-toxic material like steel, which is already readily available. Many birds, including Whooper Swans, often feed in fields away from wetlands, where it is still legal to shoot many species (depending on which nation) using lead ammunition.

And a reminder that if you want to add your voice to that of other environmentalists about the continuing use of lead shot in ammunition used for game shooting, you can sign a petition on this subject https://petition.parliament.uk/petitions/111533

Champions of the Flyway 2016

The third Champions of the Flyway bird race took place on 29th March in southern Israel. The event raised an impressive $70,000 (c. £50,000) in sponsorship. A total of 39 teams comprising 200 birders from around the world took part, racing against each other and the clock to see who could record the most species in 24 hours.

The £50,000 raised will be donated to the Hellenic Ornithological Society (BirdLife partner in Greece). More than one million birds are illegally killed in Greece every year and money raised by the teams will help to support two important projects: targeting the illegal shooting and trapping of Turtle Doves *Streptopelia turtur* and other migratory species passing through the Greek islands, and the illegal trapping of small songbirds for the cagebird black market.

The Zeiss Arctic Redpolls from Finland took the coveted title of Champions of the Flyway 2016 by logging 174 species on the day. They also raised €4,400 in sponsorship. Second place went to the IBRCE Flying Dutchmen with 171 species, and a very creditable third place went to the youngest team, the Next Generation Birders, with 164 species.

North American team The Way-Off Coursers took the 'Guardians of the Flyway' award for raising the most money – $12,000, the highest amount any team has raised in the three years of the event. The BBRC Vagrants saw 148 species and, more importantly, raised £2,276. The opportunity to add to that total is still available, at www.champions-of-the-flyway.com/the-bbrc-vagrants/

Huge scale of illegal bird killing on British base in Cyprus

It was the illegal killing of migrant songbirds in Cyprus that was the focus for the sponsorship money raised at last year's Champions of the Flyway event, in 2015.

Sadly, more than 800,000 birds were still trapped and killed on a British military base in Cyprus last autumn, according to the latest research by the RSPB and BirdLife Cyprus. They provide the main ingredient for the local and expensive 'delicacy' of *ambelopoulia* (grilled, pickled or boiled songbirds) illegally served to restaurant diners in the country. Organised crime gangs are running this illegal practice on an 'industrial scale', which is estimated by the Cypriot authorities to earn gangs on the island 15 million euros annually.

Survey data from BirdLife Cyprus and other organisations have recorded more than 150 species that have been trapped in nets or on lime sticks. More than half of these species are of conservation concern including the island's two endemic breeders: Cyprus Warbler *Sylvia melanothorax* and Cyprus Wheatear *Oenanthe cypriaca*. Both of these songbirds have been found illegally trapped.

On a positive note, the results from 2015 show that the annual increases of the last five years in numbers of birds killed on British Territory in Cyprus have been halted, thanks to various measures taken to tackle the problem by the base authorities. The numbers, however, are still at record-breaking levels, with illegal killing still far worse on British Territory than in the Republic of Cyprus.

'The RSPB congratulates the British Sovereign Base Area for taking important steps in tackling the illegal killing occurring on MoD land. Approximately one-third of the invasive *Acacia* trees which were planted on the firing range to attract migrant birds have been removed and these efforts are to be applauded,' said Jonathan Hall, head of UK Overseas Territories at the RSPB.

'However, we are disappointed that the numbers of birds still being trapped for huge profit by organised gangs remains unacceptably high and the rest of this illegal killing infrastructure needs to be removed in order to put an end to this barbaric practice.'

The latest survey data confirmed the large scale of illegal bird trapping, both with mist-nets and with lime sticks. The survey found that as much as 19 km of mist-nets could have been active during the autumn of 2015. These trapping levels could have resulted in more than two million birds killed across the island as a whole. More than 5,300 lime sticks were confiscated by enforcement agencies, mostly in the Republic. Long avenues of planted *Acacia* trees resemble vineyards with mounds of gravel at one side. The gravel is brought in by truck and is thrown to scare the birds into the nets.

'The scale of the trapping found within the survey area has to be seen to be believed,' said Clairie Papazoglou, Executive Director of BirdLife Cyprus, who added that a 'consistent zero tolerance approach' was the only answer to this depressing state of affairs.

New Spurn Bird Observatory opens its doors

Ian Walker

140. The new Bird Observatory at Spurn, April 2016.

Spurn Bird Observatory became the first accredited mainland observatory in 1946 when it joined Skokholm and Isle of May on the Bird Observatories Council. Since that time it has operated from the Warren Cottage at Spurn, which it leased initially from the War Department and more recently from the Yorkshire Wildlife Trust. However, in recent years the area around the cottage has been subject to significant coastal

erosion and the long-term future of the observatory has been in jeopardy.

In summer 2015, a detached residential property, in an ideal location (backing onto land owned by the Observatory Trust), came on the market. This was a once-in-a-lifetime opportunity to secure the future of the observatory and swift action was required. There was no time to fundraise. After some negotiation, the Trust directors were able to secure a mortgage to enable purchase of the property, and then a team of dedicated volunteers spent the winter transforming it into a modern, comfortable observatory. It can house 13 visitors, in four rooms with two showers; there's a comfortable lounge with computer and wifi and a large, well-equipped kitchen. The new building was officially opened on Easter Sunday by Trust patron Mike Dilger in the presence of 250 well-wishers.

This is a major landmark in the 70-year history of the observatory and will hopefully ensure the future of many recent initiatives by the Trust. The September Migration Festival is perhaps now the biggest event in the birdwatching calendar after the Birdfair and in 2016 will be hosted in conjunction with the Trust's new partners, the BTO. The Young Birder of the Year award is a key part of the Festival, and is a partnership initiative with the BTO and Next Generation Birders.

While there was no time to fundraise to secure the purchase of the new building, it is of course vital that the Trust continues its 'regular observatory work' – and thus anyone wishing to help pay off the mortgage and assist in replenishing those crucial financial reserves can make a donation online at: https://campaign.justgiving.com/charity/spurnbirdobservatory/newobservatory

For more information on the work of the observatory or staying there, you can visit: www.spurnbirdobservatory.co.uk

What happens to my bird books when I'm gone?

This was a question first posed by *BB* Board member Chris Spooner in January (*Brit. Birds* 109: 6) and it's provoked a fair number of responses from *BB* subscribers. Gordon Clarke, from Kendal in Cumbria contacted *N&c* to say: 'A large, often expensive, collection of books leads one to want to be able to pass it on to wherever it will be appreciated, for example to the BTO. No organisation can store and maintain huge collections, however, and personally I would expect them to retain any "wants" and dispose of the rest to their credit. That way both the donor and the recipient should be satisfied.'

And RSPB Frampton warden Toby Collett may have another solution: 'My first thought would be for prospective donors to forge links with the Next Generation Birders. NGBs could make anonymous submissions with an open letter describing themselves, where they bird and what they enjoy about birding and then it comes down to the donors of the books to decide which of these birders appeal to them and which they would like to leave their books to.

'Another less romantic option is donating them to bird observatories, which can then have second-hand book sales, either in person or online, much as Portland does. These raise vital funds for observatories and you know the audience is the right one for the books to go to.'

British Birds e-newsletter

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Common Buzzard nests, nest trees and prey remains in Avon

Robin Prytherch

Robin Prytherch

Abstract Detailed records of 108 Common Buzzard *Buteo buteo* nests were kept during 1997–2004 as part of a long-term study of the species in Avon. Various aspects of the nest were measured, including size and supporting structure, height above ground, and height and species of tree. Nests varied in size from 1,244 to 4,196 cm^2. Larger broods were in the biggest nests, and were also significantly earlier than smaller broods. Nest and tree heights matched those in other studies in Britain. Seventeen tree species were used, with Oak *Quercus robur* the most frequent. Ivy *Hedera helix* was an important component in nest structure but nests with Ivy were less successful than those without. Food remains at nests showed a wide variety of prey, similar to that of other British studies. The commonest mammal was the Rabbit *Oryctolagus cuniculus* (71%) and the commonest bird species was the Wood Pigeon *Columba palumbus* (27%).

During the course of my long-term study of the Common Buzzard *Buteo buteo* in Avon (see Prytherch 2013 for a summary, and a description of the habitat), I looked for more accessible nest sites so that I could record the breeding success of pairs. On some occasions I managed to climb to the nest to ring the chicks (see Prytherch & Roberts 2012). This paper is based on data from those nests, since while at the nests I had an opportunity to inspect them in detail and make a series of measurements. Typically, I made several measurements across the top of each nest (see fig. 1) and, where possible, also measured the depth of the nest. In many cases, I also measured the height of the nest in the tree and, where possible, the height of the tree. In

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addition, I noted the tree species and whether or not the nest was supported by Common Ivy *Hedera helix*. All prey remains found in the nest were recorded, plus any items found on the ground below the nest. Only nests with complete data have been included here. These measurements were gathered over an eight-year period, 1997 to 2004.

A total of 108 nests were sampled during the eight-year period; 104 nest measurements are reported here; four sets of measurements were excluded as they were unsatisfactory. Some nest sites were used in more than one year and the repaired nests varied between years, becoming either larger or smaller. Five sites were reused once and three sites were reused twice. Data for repaired nests are included in the figures presented in this paper.

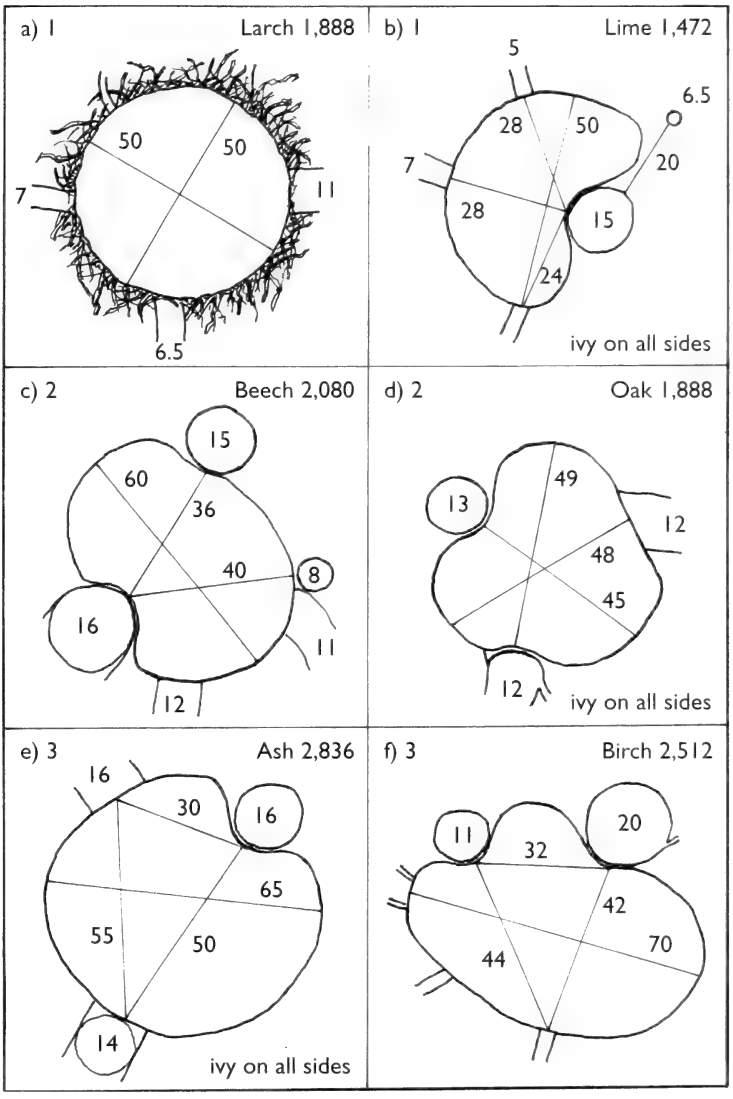
During the course of incubation and particularly after hatching, adults bring in fresh sprigs of greenery to the nest. They no longer bring in dead, unyielding boughs of the type used in the building of the main structure; in one exceptional case, not included in the sample reported here, the nest slowly changed from a large bowl to a flat platform before the chicks fledged. The amount of greenery varies between nests and some birds bring in so much that it spills over the edge and hangs down from the nest platform. Thirty-one (29.8%) of the 104 measured nests had such 'spill-over' but these sprigs were not considered when measuring the size of the platform of each nest (see below).

Nest characteristics

When at the nest, with my safety harness clipped to the tree, and when the chicks had been lowered to the ground to be ringed and measured by colleagues, I was able to measure the nest and record prey remains. Measuring the nest was not necessarily straightforward, since many nest platforms were irregularly shaped and all looked rather ill-defined at first sight. I soon discovered, however, that by pressing down lightly around the edge of the nest I could determine the limits of the load-bearing surface. The position of supporting branches and twigs were also noted, together with the orientation

Robin Prytherch

141. A Common Buzzard *Buteo buteo* nest in a hedgerow Oak *Quercus robur* tree in May 2013. The inset shows a closer view of the nest. This is a rather exposed site and was deserted during incubation owing to wind and heavy rain – and not reused in subsequent years.



Robin Prytherch

Fig. 1. Outlines of six Common Buzzard *Buteo buteo* nests. The outlines are of the top load-bearing surfaces with the surrounding supporting branches/trunks. Fig. 1 (a) also indicates the usual extent of some branches and twigs which extend beyond the load-bearing area to make up the complete nest. Ivy *Hedera helix* also contributed to the support of nests (b), (d) and (e). Nests (a) and b) held one chick, (c) and (d) had two chicks and (e) and (f) had three chicks. Apart from nest (a), the others are irregularly shaped nests, although three – (b), (c) and (f) – are close to being ovoid. The notes accompanying each nest indicate tree species and nest area in cm². Other measurements are in cm. Orientation is with north at the top.

of the nest (see below). The visit to ring chicks and measure the nest was timed to occur when the chicks were approximately 32 days old; by this stage, the nest platforms had become flattened so that the central cup (in which the eggs and small chicks were brooded) was greatly reduced in depth. The total depth of the nest was measured where possible.

Plotting the nest measurements onto a pro-forma sheet revealed a great variety of shapes. About a quarter were close to circular, many more (just under half) were ovoid, with the other quarter irregularly shaped – some kidney shaped, others a more complex shape. There seemed to be no obvious link between nest shape and the number of chicks in each nest. Some very large nests held just one chick but there was a general tendency for larger broods to be in larger nests (see below). Nests were generally more consistent in some basic measurements, typically around 30 cm across at the narrowest point and usually 50–70 cm (although exceptionally up to 80–90 cm) at the widest point.

The surface area of the 104 measured nest platforms varied between 1,244 and 4,196 cm² with an overall mean of 2,212 cm². Subdividing the nests into those which held one chick (n=47), two chicks (n=42), three chicks (n=13) or four chicks (n=2) revealed some surprising differences, with means of 2,133 cm² for single-chick nests, 2,147 cm² for two-chick nests, 2,647 cm² for three-chick nests and 2,906 cm² for four-chick nests. When I compared the variation in size between

nests that held one or two chicks, and nests that held a brood of three, the difference was highly significant (R^2=6.4%, P<0.01). Why should this be? Since Buzzards do not add structural material to their nest once incubation starts, how do they 'know' how big a nest to build before eggs are laid? This is discussed below.

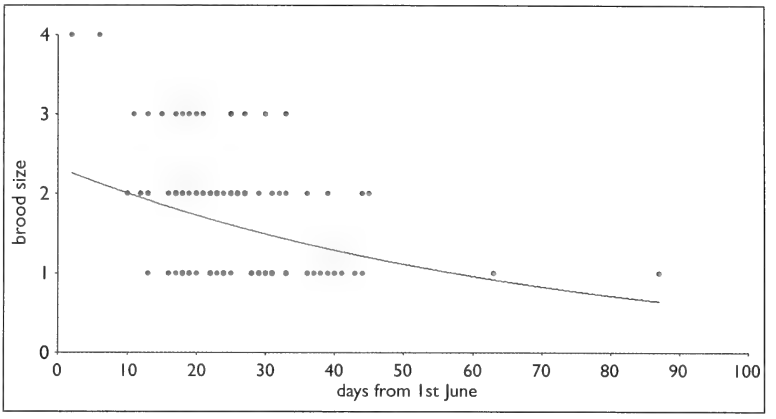


Fig. 2. Seasonal trend in brood size of Common Buzzards *Buteo buteo* in Avon, 1997–2004. Data show chicks at ringing age, approximately 32 days old.

The depth of the nest cup was measured in 79 nests. Of these, 11 had no measurable cup, but in the remaining 68 the mean cup depth was 4.34 cm (range 1.5–12.0 cm). The depth of the cup was, on average, greater in nests with fewer chicks: 40 nests containing one chick had a mean cup depth of 4.69 cm; 32 nests containing two chicks had a mean cup depth of 4.11 cm and seven nests containing three chicks had a mean cup depth of 3.43 cm. The difference between cups with one chick and three chicks was significant (T=2.12, P=0.047) but there was no significant difference between the cups with one chick and two chicks (T=0.99, P=0.326) and between those with two chicks and three chicks (T=1.03, P=0.312). Single chicks settle in the centre of the nest; in multiple broods the largest appeared to dominate the centre of the nest with the younger one(s) to one side. The greater weight of larger broods appeared to flatten the nest more.

The depth of the whole nest was measured for the same 79 nests. The mean depth was 28.5 cm (range 13–55 cm). New nests are frequently built on top of the remains of older nests (some partly collapsed), mostly their own nest from the previous year or an old corvid nest, hence the great variation in depth. All the above sizes, apart from details of nest-cup depth, closely match those recorded nationally (Ferguson-Lees *et al.* 2011).

I recorded the orientation of nests with a compass (see fig. 1) but could detect no relationship between nest sites and the surrounding habitats and topography. Most nest sites were secluded, typically in a sheltered woodland setting, with no clear bias to adjacent slopes or compass bearing.

Seasonal trend of nesting

Since all nests were visited when the chicks were approximately the same age (c. 32 days), I was able to compare brood size with visit date. Using 1st June as day 1, I divided the nests into five-day periods and calculated the mean brood size for each period. For the nine five-day periods between 1st June and 15th July, mean productivity declined from 4.0 in the first period to 1.22 in the eighth period and 1.25 in the ninth (table 1). This shows clearly that the earlier broods were on average larger and the later ones smaller. Fig. 2 plots all the broods in my sample against date, which shows that the two

Table 1. Mean brood size of Common Buzzard *Buteo buteo* nests in Avon in five-day periods from 1st June. These dates show broods at a similar age, when chicks were approximately 32 days old.

date	mean brood size	sample size
June 1–5	4.00	1
June 6–10	3.00	2
June 11–15	2.25	8
June 16–20	1.83	24
June 21–25	1.79	24
June 26–30	1.63	19
July 1–5	1.27	11
July 6–10	1.22	9
July 11–15	1.25	4

Robin Prytherch

142. A Common Buzzard *Buteo buteo* nest in woodland, again in an Oak *Quercus robur* tree, June 2013. The inset shows a closer view of the nest. This nest has been in use since 2004, but not in every year. The author did not climb to the nest owing to the lack of suitable branches.

broods of four were ahead of all the others. In this sample of nests, only three chicks (1.7%) were lost between ringing and fledging, so brood size at c. 32 days is a good indication of productivity.

This seasonal trend in productivity is mirrored by the data on nest size: the larger nests (which contained the largest broods) were the earliest. A seasonal trend in clutch size has been demonstrated in a number of passerines (see for example Perrins 1985) and in some other raptors including Northern Goshawk *Accipiter gentilis* (Kenward 2006), Eurasian Sparrowhawk *A. nisus* (Newton 1986), Osprey *Pandion haliaetus* (Poole 1989) and Common Kestrel *Falco tinnunculus* (Village 1990).

The implication here is that the earliest breeders, which make the largest nests and produce the largest clutches, and subsequently rear the largest broods, are the fittest birds. This seasonal influence was not unexpected. During fieldwork, I monitored all pairs (some birds were recognisable individually by their distinctive plumage) by checking each territory, and I was aware that pairs with large broods seemed to be earlier and, especially, that the very late broods always involved just a single chick. Between 1997 and 2004 there were between 60 and 94 pairs per year, of which only two pairs fledged broods of four and 17 fledged broods of three. The majority of broods were of one or two chicks. A 'fit' pair will usually fledge many chicks in its lifetime, but will also fail in some years (Prytherch 2013).

Heights of nests and nest trees

Of the 108 nests in the sample reported here, I noted the tree species in each case. In addition, I recorded the height of the nest in 80 cases, and the full height of the nest tree in 56. Heights were measured by eye, after marking a 5 ft (1.5 m) point on the trunk. In some cases I was able to ground-truth estimates of nest height using the length of rope ladder from the nest to the ground; these tallied well with estimates from the ground. The full height of the tree was sometimes difficult to record due to the intermingling of

branches at the tops of the trees. The mean nest height was 12.3 m (range 6.1–19.8 m) and mean tree height 17.7 m (range 6.1–22.9 m); in other words, the nests were generally about two-thirds up.

Tree species used

There were 17 species of trees in my sample. The most commonly used was (Pedunculate) Oak (see table 2 for scientific names) with 47 nests (43.5%). There were 11 nests in Ash (10.2%) and nine in Scots Pine (8.3%). Beech and birch trees held six nests each; Turkey Oak five; Douglas Fir and larch four each; Sycamore and Wild Cherry three each; Poplar, Lime and Corsican Pine two each; and Field Maple, Alder, Norway Spruce and Yew one each. This mix of species is a good reflection of the common species available in the woods of my study area. The nests in Oaks (n=23) were slightly lower than the overall mean, at 11.2 m, which is probably a reflection of the species structure. The lowest nests were in two Oaks at 6.1 m, whereas the highest were in Beech and Corsican Pine at 19.8 m. Other nests may have been even higher, but these were not measured by me. Nests that were both lower and higher than those in my sample have been recorded elsewhere (Ferguson-Lees *et al.* 2011).

Lyndon Roberts

143. The author descending from a woodland nest on 8th June 1993 after replacing the four chicks, which had been ringed and measured on the ground. Andrew Beattie is supporting the ladder. This was the first nest the author ever climbed to, which stimulated an interest in the possibility of gaining more information on the chicks and the nests.

Ivy in nest trees

Fifty-six nests (52%) in eight species of tree were wholly or partly supported by Ivy; 33 were in Oaks, ten in Ash, five in Scots Pine, one in Poplar and all of those in Sycamore (three), lime (two), Alder (one) and Field Maple (one). The heights of 28 of the 56 Ivy nests were measured; the mean height of these was 11.6 m (range 7.3–17.4), slightly lower than the overall mean. Similarly, those in Oaks with Ivy (mean 10.9 m, range 7.3–13.7, n=16) were a little lower.

Variation in productivity

Mean productivity for the 108 nests in the sample was 1.66 chicks per nest. There were differences in productivity between various tree species (see table 2) and between nests with and without Ivy. Mean productivity of the nests in the most commonly used trees, Oak and Ash, was very similar at just over 1.6 chicks per nest, while nests in Scots Pine fledged on average 1.3 chicks per nest. For

Table 2. Tree species used by Common Buzzards *Buteo buteo* in Avon for nesting (listed in declining frequency of use), including those in Common Ivy *Hedera helix*, with the mean number of chicks produced for each species.

	trees			chicks			
	no. trees	with Ivy	without Ivy	no. chicks	mean/ nest	with Ivy	without Ivy
Pedunculate Oak *Quercus robur*	47	33	14	76	1.62	1.5	1.93
Ash *Fraxinus excelsior*	11	10	1	18	1.64	1.5	3.00
Scots Pine *Pinus sylvestris*	9	5	4	12	1.33	1.4	1.25
Beech *Fagus sylvatica*	6	0	6	8	1.33		
Birch *Betula*	6	0	6	15	2.5		
Turkey Oak *Quercus cerris*	5	0	5	6	1.2		
Douglas Fir *Pseudotsuga menziesii*	4	0	4	7	1.75		
Larch *Larix*	4	0	4	6	1.5		
Sycamore *Acer pseudoplatanus*	3	3	0	5	1.67		
Wild Cherry *Prunus avium*	3	0	3	4	1.33		
Poplar *Populus*	2	1	1	5	2.5		
Lime *Tilia*	2	2	0	3	1.5		
Corsican Pine *Pinus nigra*	2	0	2	5	2.5		
Field Maple *Acer campestre*	1	1	0	1	1		
Alder *Alnus glutinosa*	1	1	0	2	2		
Norway Spruce *Picea abies*	1	0	1	3	3		
Yew *Taxus baccata*	1	0	1	3	3		
Totals	**108**	**56**	**52**	**179**	**1.66**	**1.54**	**1.79**

the other tree species samples were too low to make useful comparisons.

Were the nests in Ivy at an advantage compared with those without Ivy? I assumed that the 'hidden' nature of the Ivy nests would make them safer and less vulnerable to predation. Yet the results suggest otherwise: the mean productivity of nests in Ivy was 1.54 chicks/nest (n=56), but in nests without Ivy was 1.79 chicks/nest (n=52). This difference is significant (z=1.65, P=0.05) and perhaps suggests that Ivy might be used where other more ideal supports are not available or that the Ivy attracts potential predators as a place where a nest might be concealed. The main predator is likely to be the Carrion Crow *Corvus corone* and possibly the Grey Squirrel *Sciurus carolinensis* but I have no direct evidence of their actions.

Prey remains in nests

All 108 nests were checked for prey remains and in a few cases items found below the nest were included in the results (table 3, where scientific names of the species are shown). At only one nest could I find no prey remains.

Robin Prytherch

Robin Prytherch

144 & 145. Three Common Buzzard *Buteo buteo* chicks in a woodland nest, this time in a birch *Betula* tree, June 1998. Plate 145 shows the same nest with the author's measuring kit in place of the chicks (which are being processed below on the ground). The 'kit' comprises notebook, tape measure, compass and a roll of nylon cord, used to lower and raise the chicks in a bag. The prey remnant is of a Stoat *Mustela erminea*, which is unusual in this study area.

These remains included 122 records of nine mammal species, two records of two species of amphibian, and 177 records of 23 bird species. In addition there were four unidentified items of mammalian fur and seven unidentified feathers.

Rabbits dominated the remains of mammalian prey found, accounting for over 71% of all items, whereas only five records were of vole sp. (<5%). However, I feel sure that these statistics are misleading and the balance should be more even. From field observations I know that Buzzards take many voles but, presumably owing to the small size of the prey, remains are rarely found at nests. I did visit one nest (outwith the period considered for this paper) where I found a large number of discarded dead voles. Many were desiccated and I could only guess at the number (probably over 12). I subsequently discovered that the female Buzzard had died, and that the male had continued to deliver prey. Only one of the two chicks was able to feed itself and it fledged; the smaller chick died. (The male does not feed the chicks but provisions the nest, leaving the female responsible for feeding the chicks until they can deal with food for themselves, after about 28 days.) Because of the size of even small Rabbits, parts of this prey are likely to remain in the nest from day to day, and are more likely to be recorded.

Table 3. Prey items at 108 Common Buzzard *Buteo buteo* nests in Avon; data show total number of records, with % of each group in parentheses for mammals and birds. Not shown here are four unidentified items of mammalian fur and seven unidentified feathers.

mammals	
Pygmy Shrew *Sorex minutus*	1 (0.82)
Mole *Talpa europaea*	13 (10.7)
Rabbit *Oryctolagus cuniculus*	87 (71.3)
Brown Hare *Lepus europaeus*	2 (1.64)
Grey Squirrel *Sciurus carolinensis*	10 (8.2)
Brown Rat *Rattus norvegicus*	1 (0.82)
Bank/Common Vole *Clethrinomys glareolus*/ *Microtus arvalis*	5 (4.1)
Red Fox *Vulpes vulpes* (cub)	1 (0.82)
Stoat *Mustela erminea*	2 (1.64)
amphibians	
Common Toad *Bufo bufo*	1
Common Frog *Rana temporaria*	1
birds	
Mallard *Anas platyrhynchos*	2 (1.1)
Red-legged Partridge *Alectoris rufa*	1 (0.6)
Common Pheasant *Phasianus colchicus*	10 (5.6)
Moorhen *Gallinula chloropus*	1 (0.6)
Herring Gull *Larus argentatus*	1 (0.6)
Feral Pigeon *Columba livia*	4 (2.3)
Wood Pigeon *Columba palumbus*	47 (26.6)
Little Owl *Athene noctua*	2 (1.1)
Tawny Owl *Strix aluco*	4 (2.3)
Green Woodpecker *Picus viridis*	7 (4.0)
Great Spotted Woodpecker *Dendrocopos major*	1 (0.6)
Magpie *Pica pica*	18 (10.2)
Eurasian Jay *Garrulus glandarius*	5 (2.8)
Jackdaw *Corvus monedula*	4 (2.3)
Carrion Crow *Corvus corone*	34 (19.2)
Corvus sp.	13 (7.3)
Blue Tit *Cyanistes caeruleus*	1 (0.6)
Skylark *Alauda arvensis*	1 (0.6)
Common Starling *Sturnus vulgaris*	1 (0.6)
Blackbird *Turdus merula*	11 (6.2)
Song Thrush *Turdus philomelos*	5 (2.8)
Robin *Erithacus rubecula*	2 (1.1)
Common Chaffinch *Fringilla coelebs*	1 (0.6))
Greenfinch *Chloris chloris*	1 (0.6)

More remarkable, perhaps, is the great variety and number of bird prey items. Most of them were identified from just a few feathers. These were usually from fully grown birds and only occasionally of pulli. It seems that male Buzzards were well capable of catching birds, especially the larger species such as Carrion Crow and Wood Pigeon, although the few Common Pheasants found were presumably scavenged (probably road kills) – and it is conceivable that some of the crows and pigeons were scavenged, since both are regularly killed as 'pest' species. Similarly, some of the small species may well have been scavenged from Sparrowhawks (kleptoparasitism). I have seen male Buzzards chase Sparrowhawks with prey, and a Buzzard can follow a Sparrowhawk surprisingly closely until the latter escapes to cover (for example into a dense hedge). But presumably the Buzzard must be successful in securing the prey directly on some occasions.

Lyndon Roberts

Robin Prytherch

146 & 147. The author climbing down the almost invisible wire rope ladder from an Ash *Fraxinus excelsior* (one of two trees standing alone in a grass meadow) after replacing three chicks on 15th June 1997. The nest was one of the first to be measured in this study.

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Table 3 demonstrates the enormous variety of prey taken by the opportunistic Buzzard in this study area and is typical of this species in Britain (*BWP*; Swann & Etheridge 1995).

Acknowledgments

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Important Bird Areas

The Cayman Islands in 2016

Patricia E. Bradley

Abstract The Cayman Islands, in the western Caribbean, are a UK Overseas Territory. Three main islands support a wide range of birds, with 17 endemic races of breeding landbird. The Grand Cayman Thrush *Turdus ravidus*, currently treated as the only endemic bird species, was last seen in 1938. However, taxonomic research may mean that 'Taylor's Bullfinch' *Melopyrrha (nigra) taylori*, which occurs only on Grand Cayman, is eventually treated as a full species. The currently rapid human population growth (with a variety of associated development pressures) and the prospect of an increased number and severity of tropical storms are two of the most important threats to the biodiversity of these islands. Strategies to address these issues by the National Trust and National Conservation Council are discussed.

Introduction

The UK Overseas Territory of the Cayman Islands might not be an immediate choice for a Caribbean birding destination when compared with its larger and endemic-rich Greater Antillean neighbours Cuba, Hispaniola and Jamaica. Yet the three Cayman Islands (plus a few small cays) support an eclectic mix of breeding birds, migrants and seabirds, together with endemic reptiles and plants. Emerging conservation strategies are discussed on how to manage biodiversity in small island ecosystems where invasive species and a lack of development planning have a major impact.

The Cayman Islands lie in the western Caribbean, roughly 700 km south of Miami, Florida, 250 km south of Cuba, and 250 km WNW of Jamaica. Grand Cayman (35 km long, 8 km wide and 197 km²) is the largest and most westerly island, with a maximum elevation of 22 m; it supports 96% of the total population of the islands, which is around 56,000. Grand Cayman lies c. 130 km southwest of Little Cayman and Cayman Brac, which are separated from each other by a channel 7 km wide. Cayman Brac has a population of around 1,900 and is 38 km² in extent with a maximum elevation, at the eastern end of the bluff plateau, of 43 m above sea level, the highest point in the Cayman Islands. Little Cayman (28 km², maximum elevation of 14 m) has a population of around 200.

The three islands are emergent peaks on the submarine Cayman Ridge, lying on a separate fault block surrounded by ocean deeps in excess of 2,000 m. The central part of each island is formed of an exposed platform of hard limestone, Bluff dolostone, of Oligocene, Miocene and late Pliocene origin (from 30 to 3 million years old). Parts of each island are thought to have been above sea level for at least two million years, and these areas are where the endemic fauna and flora are now concentrated. The rock typically has a jagged surface with honeycombed pinnacles, fissures and sinkholes, where the root systems of the dense vegetation penetrate the rock and channel rainwater, which dissolves the limestone to form extensive cave systems and deep cavities. The dolostone supports the important dry forest and shrubland vegetation. The ancient limestone core of each island is overlain by a coastal terrace of Pleistocene Ironshore Formation (124,000 ±8,000

Yves-Jacques Rey-Millet

148. Almost a fifth of the world population of the West Indian Whistling Duck *Dendrocygna arborea* occurs in the Cayman Islands, where this adult was photographed in February 2011. The species breeds on all three islands, and the last census, in 2003, found 2,156 birds.

years BP), a hard calcrete crust underlain by a soft limestone conglomerate. With an elevation of around 4 m, this comprises around 40% of the land area of western Grand Cayman and Little Cayman, where it is associated with mangroves, but <5% of Cayman Brac.

The climate, dominated by the trade winds, has two distinct seasons: humid and wet from May to November and dry to semi-arid from December to April. Cold fronts from North America bring northerly winter storms from December to March. Hurricanes, from June to December, have had profound effects on the islands' habitats and wildlife, with four major storms during 2004–10 causing catastrophic felling of forests and canopy loss, and sea surges that inundate the mangrove forest causing rapid die-off.

The islands were first reported by Christopher Columbus in 1503, and no archaeological evidence of any permanent settlement by indigenous people has been found. Grand Cayman was first settled in the mid eighteenth century, around 100 years before Little Cayman and Cayman Brac. From the sixteenth century, the islands became an important provisioning stop for the Spanish main fleet, as well as for pirates and privateers, chiefly due to the abundance of Green Turtles *Chelonia mydas*. Parrots were mentioned as being taken as pets by sailors but it was not until 1886 that the first avian collection was made by Maynard for Charles B. Cory (Cory 1892), by which time the avifauna of the Bahamas and Greater Antilles had been well documented.

Environmental and conservation bodies in the Cayman Islands

The Department of the Environment (DOE) is responsible for the terrestrial and marine environment and biodiversity in the Cayman Islands. It includes a small Terrestrial Research Unit responsible for conservation including monitoring species of Global Concern. In 2013, the National Conservation Law (NCL) was passed, a long-awaited milestone that will allow a National Protected Areas System to become a reality. The Cayman Islands Government (CIG) has

appointed a National Conservation Council (NCC), which is tasked with 'promoting the biological diversity and the conservation and sustainable use of the natural resources of the Islands'. The NCC is presently preparing the administrative and legal framework for the NCL to be brought fully into force by the Cabinet. The Animals Law is to be incorporated into the NCL, where all species of birds are protected (except White-winged Dove *Zenaida asiatica* and Blue-winged Teal *Anas discors*, which may be hunted from 1st August to 31st January). The NCL includes the provision of an Environmental Protection Fund (EPF), collected as part of a departure tax. The fund will be managed by the NCC and holds huge potential for acquiring and managing future protected areas. The local government is a signatory to a number of international conservation agreements (including the Ramsar, Bonn and Rio Conventions), which require it to establish and maintain a system of protected areas sufficient to protect biodiversity.

The National Trust for the Cayman Islands (NTCI), a statutory body established in 1989, is the only NGO responsible for the protection and conservation of the islands' ecosystems and biodiversity, both terrestrial and marine. The NTCI Law (2003 Revision) protects the Trust's land holding, received by donation, purchase or gifted from the CIG, and allows land to be declared inalienable. To date, 1,270 ha (5.5%) of the land area of the three islands is protected by the NTCI Law, much of it donated by the CIG.

The wider avifauna

The Cayman Islands are, in effect, oceanic islands, with no history of attachment to mainland America. The greatest affinity of the avifauna is with the Greater Antilles, especially with the closest islands of Cuba (24 species shared) and Jamaica (19); 18 are shared with the American mainland. The composition of the avifauna reflects the small size of the islands, their geographical position, low relief and limited habitat diversity. Eighteen species endemic to the Caribbean occur in the Cayman Islands.

Morgan (1994) identified 34 bird species from avian fossils (14,000–4,500 years BP) during the Pleistocene–Holocene transition, of which four are now extinct (including a new species of bullfinch from Cayman Brac) and 22 are still present. He estimated that at least five of eight other species lost had survived into the post-Colombian era but disappeared before the historical record – including large colonies of Audubon's Shearwater *Puffinus lherminieri* on Cayman Brac. Morgan's work suggests that the Pleistocene avifaunas of Grand Cayman and Cayman Brac were much more homogenous and that, for example, Northern Flicker *Colaptes auratus*, Western Spindalis *Spindalis zena* and Cuban Bullfinch *Melopyrrha nigra* were present on both islands, whereas none occur today on Cayman Brac.

The total number of species recorded in

Yves-Jacques Rey-Millet

149. Adult 'Cayman Parrot' *Amazona leucocephala caymanensis*, March 2009. One of two endemic races of the Cuban Amazon in the Cayman Islands, *caymanensis* occurs only on Grand Cayman.

the Cayman Islands is 247, of which 50 are (or have been) regular breeders (involving 41 genera in 22 families; 20 waterbirds and 30 landbirds); 177 are considered regular migrants (in winter and on passage), with the remainder being vagrants (Bradley 2000; Bradley & Rey-Millet 2013). Four species have established feral breeding populations.

Breeding seabirds, waterbirds and shorebirds

Of the 20 species (representing 16 genera in ten families), 16 breed on Grand Cayman, 13 on Little Cayman and 12 on Cayman Brac; 16 of the 20 are resident on one or more of the islands throughout the year.

Three breeding seabirds are resident: a large colony of Red-footed Boobies *Sula sula* breeds alongside Magnificent Frigatebirds *Fregata magnificens* on Little Cayman, and there is a small colony of Brown Boobies *S. leucogaster* (c. 80–120 pairs) on the eastern bluff on Cayman Brac. There are three migrant summer breeders also: White-tailed Tropicbirds *Phaethon lepturus* breed on Cayman Brac (400 pairs in the 1980s, fewer than 50 in 2011) and Grand Cayman (20–25 pairs in 2014) from December to August. Bridled Terns *Onychoprion anaethetus* (c. 20 pairs) breed on a cay off Grand Cayman from May to August and 'Least Terns' *Sternula (albifrons) antillarum*, in decline throughout the Caribbean, breed in ever-decreasing numbers on Grand Cayman; there have been no confirmed breeding records on Little Cayman and Cayman Brac since 2005 (Bradley 2009).

Resident waterbirds and shorebirds are augmented by migrant populations in winter and on passage. Ten species breed on all three islands: West Indian Whistling Duck *Dendrocygna arborea* is the key species, the only endemic duck in the West Indies, and is discussed more fully below. The other nine species breeding on all three islands are Pied-billed Grebe *Podilymbus podiceps*, Tricolored Heron *Egretta tricolor*, Yellow-crowned Night Heron *Nyctanassa violacea*, Cattle Egret *Bubulcus ibis*, Green Heron *Butorides virescens*, American Coot *Fulica americana*, Common Gallinule *Gallinula galeata*, Black-necked Stilt *Himantopus mexicanus* and Willet *Tringa semipalmata*. Snowy Egrets *E. thula* breed in two large, mixed heronries

Patricia Bradley

150. An aerial view along the border between the Black Mangrove *Avicennia germinans* forest of the Central Mangrove Wetlands IBA (left) and the dry forest of the Mastic Reserve IBA (right/foreground), Grand Cayman, May 2012. Both forest types provide prime parrot breeding habitat.

with Tricolored Herons, one each on Grand Cayman and Little Cayman, where there are only four breeding records of Little Blue Heron *E. caerulea*. Least Bittern *Ixobrychus exilis* and Purple Gallinule *Porphyrio martinicus* breed only on Grand Cayman, where numbers have declined sharply owing to loss of freshwater habitat. On Little Cayman and Cayman Brac, breeding occurs in late winter and spring before wet areas dry out, while in years of low rainfall or drought, many species fail to breed.

Landbirds

Of the 29 current breeding landbirds (24 genera in 12 families), 27 breed on Grand Cayman, 17 on Little Cayman and 20 on Cayman Brac; 26 are resident, and three are summer visitors. There are no endemic genera, but two genera endemic to the Greater Antilles: *Spindalis* and *Melopyrrha*. Two species are now extinct (a fossil bullfinch and Grand Cayman Thrush *Turdus ravidus*). There are some 17 endemic races of birds, of 14 species, found in the Cayman Islands (table 1), and nine indigenous landbirds are resident on all three islands. The key species from a conservation viewpoint are described in more detail in the next section.

White-crowned Pigeon *Patagioenas leucocephala* and White-winged Dove are both mainly migratory, with numbers lowest in winter. Populations of Smooth-billed Ani *Crotophaga ani* and Northern Mockingbird *Mimus polyglottos* increased greatly on Grand Cayman following the 2004 hurricane while those of White-crowned Pigeon and Zenaida Dove *Z. aurita* have declined. La Sagra's Flycatcher *Myiarchus sagrae* is confined to Grand Cayman, occurring in forest, shrubland and mangrove edge. A small population of Short-eared Owl (all specimens identified being of the Cuban race, *Asio flammeus cubensis*) breeds on Grand Cayman and Cayman Brac, and these surely reflect the population explosion of this species on Cuba. Yellow-faced Grassquits *Tiaris olivaceus* on Grand Cayman were severely affected by Hurricane Ivan in 2004, after which they were present at just two sites, both gardens with bird feeders; Hurricane Paloma, in 2010, had a similar impact on the populations on Little Cayman and Cayman Brac, which have yet to recover.

Three species are austral migrants from South America: Antillean Nighthawk *Chordeiles gundlachii* breeds on all three islands, Grey Kingbird *Tyrannus dominicensis* breeds abundantly on Cayman Brac and Little Cayman and intermittently on Grand Cayman, and Black-whiskered Vireo *Vireo altiloquus* breeds on Cayman Brac and Little Cayman only.

Since 1900, four species have become established naturally: Cattle Egret (1957) and Short-eared Owl (1997) now breed on all three islands, while on Grand Cayman Least Bittern arrived in the mid 1990s and Bridled Tern in 1995. Three species introduced in the 1990s also breed: Rock Dove *Columba livia* on Grand Cayman and Cayman Brac, close to urban areas; and on Grand Cayman Yellow-crowned Amazon *Amazona ochrocephala* and Monk Parakeet *Myiopsitta monachus*. House Sparrows *Passer domesticus* became established on Grand Cayman in 2007, perhaps having arrived on ships. There are two records of Shiny Cowbird *Molothrus bonariensis* breeding in the 1990s; this species colonised Cuba in 1982, Jamaica in 1992 and the Bahamas in 1994, and is potentially a significant problem (its negative impact on the endemic Puerto Rican Vireo *V. latimeri* is well documented).

Birds of Conservation Importance

Endemic birds

The Grand Cayman Thrush, the sole endemic bird species in the Cayman Islands, was last seen in 1938. Although the process of extinction may have begun much earlier, it was probably hastened through loss of primary forest in the eighteenth and early nineteenth centuries. It seems likely that it finally succumbed to the devastation following hurricanes in 1933 and 1935 (the guide who led W. W. Brown in 1911 reported that he did not see the thrush after 1935). In 1911, Lowe (1911) did not see the thrush, and Brown noted its scarcity; he found it in only two areas of forest, and believed it to be on the verge of extinction. Nonetheless, he collected 13 specimens, having been 'careful to leave birds to perpetuate the species' (Bangs 1916). Savage English, who lived on Grand Cayman from 1912 to 1914, did not

Table 1. Distribution of endemic races of landbirds found in the Cayman Islands. Key: Grand Cayman (GC), Little Cayman (LC) and Cayman Brac (CB). * Species of global conservation concern, ** Restricted range or *** Biome species.

species		race	distribution and status
Caribbean Dove	*Leptotila jamaicensis*	*collaris*	(GC) ***
Cuban Amazon	*Amazona leucocephala*	*caymanensis* ('Cayman Parrot')	(GC) *
		hesterna ('Brac Parrot')	(CB) *
West Indian Woodpecker	*Melanerpes superciliaris*	*caymanensis*	(GC)***
Northern Flicker	*Colaptes auratus*	*gundlachi*	(GC)
Caribbean Elaenia	*Elaenia martinica*	*caymanensis*	(GC, LC, CB)
Loggerhead Kingbird	*Tyrannus caudifasciatus*	*caymanensis*	(GC, CB)**
Red-legged Thrush	*Turdus plumbeus*	*coryi*	(CB)***
Thick-billed Vireo	*Vireo crassirostris*	*alleni*	(GC, CB)**
Yucatan Vireo	*Vireo magister*	*caymanensis*	(GC)**
Bananaquit	*Coereba flaveola*	*sharpei*	(GC, LC, CB)
Vitelline Warbler	*Setophaga vitellina*	*vitellina*	(GC)*
		crawfordi	(LC, CB)*
Western Spindalis	*Spindalis zena*	*salvini*	(GC)***
Cuban Bullfinch	*Melopyrrha nigra*	*taylori*	(GC)**
Greater Antillean Grackle	*Quiscalus niger*	*caymanensis*	(GC)***
		bangsi	(LC)

see the thrush until his third year on the island. David W. Johnston searched extensively for the species in the 1960s and concluded that C. B. Lewis, of the 1938 Oxford Expedition, was the last known person to see the Grand Cayman Thrush in the forested eastern districts and that it was most likely extinct (Johnston 1969). No subsequent searches have been successful.

There are some 17 endemic races of birds, of 14 species, found in the Cayman Islands (table 1). Thirteen are found on Grand Cayman, nine of which are confined to that island; Cayman Brac has seven, two races confined to the Brac; and Little Cayman has four, one confined to that island. The changing fortunes of some of these endemic races reflect the challenging conditions on very small islands: until the mid twentieth century the Cuban Amazon *Amazona leucocephala hesterna* (also known as the 'Brac Parrot'), Loggerhead Kingbird *Tyrannus caudifasciatus caymanensis* and Thick-billed Vireo *Vireo crassirostris alleni* bred on Little Cayman; all have now been lost, although occasionally all three species still fly over from Cayman Brac in search of food. Similarly, the Greater Antillean Grackle *Quiscalus niger bangsi* formerly bred on Cayman Brac but now occurs only on Little Cayman. The Jamaican Oriole *Icterus leucopteryx bairdi* has also been lost from the Cayman Islands; it was last photographed in George Town in 1968 but not noted in literature after 1930 (Bradley 2000).

The Cayman Islands are presently classified as a secondary bird area (SO14), holding only one endemic species, the extinct Grand Cayman Thrush (Bradley *et al.* 2006; but see p. 280 below). Birds of Conservation Importance are selected under the following categories: Species of global concern A1, Restricted-range species A2, Species restricted to one biome A3, and Species belonging to congregations A4 – (i) colonial waterbirds or (ii) congregatory seabirds. Several species appear under two categories.

Species of global concern

Vulnerable A1, A4 (i)

The **West Indian Whistling Duck**, a West Indian endemic, occurs on all three Cayman Islands. The last population census, in 2003, revealed 2,156 birds, almost 17% of the estimated global population of 13,000 individuals. The majority of these (c. 1,800) were on Grand Cayman (Bradley *et al.* 2006). While there has been no further monitoring, numbers have

increased on Grand Cayman after hunting was banned. Legally protected in 1989, and with the help of a public education programme and a feeding station, the population slowly increased from a low point of around 200 birds in 1986 (Bradley 1986). The majority of the population breeds in the Central Mangrove Wetland (KY001, see table 2), with small populations on the Salina (KY003). After 2000, the species began dispersing into urban areas with small ponds, golf courses, wetlands including South Sound, and throughout the eastern districts. On Little Cayman, hunting reduced numbers to c. 45 birds in 1986. It now breeds throughout the Crown Wetlands (KY009) and at Booby Pond (KY007); numbers fluctuated between 180 and 320 birds up to 2003, depending on drought conditions, and the population has declined since Hurricane Paloma in 2008. On Cayman Brac a small population breeds on the westerly wetlands and The Marshes.

Near Threatened A I

There are four races of **Cuban Amazon**, each endemic to their respective island or island groups: one each in Cuba and the Bahamas and two in the Cayman Islands. In total, the Cayman Islands held c. 2,400 birds (24% of the total global population) in 1995, estimated to be 7,167 (4,943–9,976) birds in 2015 (Bradley *et al.* 2006; Haakonsson *et al.* in press). Breeding success was found to be low for both races in the most recent survey. Habitat loss remains the main threat where private land is available for development or road construction, resulting in fragmentation and clearing of mature forest. Illegal shooting as a crop pest continues, as does a reduced amount of hunting and trapping.

'Cayman Parrot' *A. l. caymanensis* breeds only on Grand Cayman. The 1995 population count estimated 1,408–1,935 individuals, which by 2014 had increased to 6,395 (4,340–8,997) birds (Bradley *et al.* 2006; Haakonsson *et al.* in press). This population ranges across much of the island with flocks breeding in dry and mangrove forest, and individual pairs breeding close to urban areas. Parrots are represented in six IBAs, of which c. 400 ha is protected dry forest, and c. 700 ha is privately owned and unprotected.

'Brac Parrot' *A. l. hesterna* breeds on Cayman Brac; population estimates were 45 birds in 1985 (Bradley 1986), 220–430 in 1992 (Wiley *et al.* 1992) and 772 birds (603–989) in 2015 (Haakonsson *et al.* in press). This race was

Yves-Jacques Rey-Millet

151. Adult male 'Brac Parrot' *Amazona leucocephala hesterna*, February 2011. This endemic race of the Cuban Amazon, is found only on Cayman Brac, where the population numbers fewer than 1,000 individuals.

extirpated on Little Cayman sometime before 1944. It has the smallest population of any Amazon and the most limited range (38 km²). If recognised as an endemic species, which seems likely from preliminary work, it would be one of the most endangered birds in the world.

It breeds only in mature forest on the Cayman Brac bluff, but forages throughout the island. Long-term studies are needed to assess whether such a small population can survive amid severe habitat loss, and to establish whether the current low breeding success is due to an ageing population, lack of suitable nest cavities and/or constraints on food availability (it seems likely that all three contribute). Brac Parrot is at a further disadvantage in nest-site selection owing to the absence of any species of breeding woodpecker to initiate cavity construction; in Grand Cayman, Cayman Parrots often share the same tree with West Indian Woodpeckers *Melanerpes superciliaris*, the parrot occupying a site prepared by a woodpecker the previous year. A management plan for the Brac Parrot will almost certainly require additional protected habitat, and possibly artificial nests and a captive breeding programme. Feral cats and rats are also a major problem for many bird species on the Brac, including the parrot.

Two of the three races of **Vitelline Warbler** *Setophaga vitellina* breed on the Cayman Islands: *S. v. vitellina* on Grand Cayman and *S. v. crawfordi* on Little Cayman and Cayman Brac. There are few data on the third race, *S. v. nelsoni*, found on the tiny Swan Islands (between Cayman and Honduras). Around 97% of the global population is resident in the Cayman Islands, 67% of that total on Grand Cayman, 22% on Cayman Brac and 11% on Little Cayman. The species is Near Threatened because of its restricted range; both races are represented in all the forested IBAs, where their preferred habitats of low-elevation dry forest/woodland and dry shrubland/woodland dominated by Silver Thatch Palm *Coccothrinax proctorii* are threatened on both islands. It is scarce to absent in western Grand Cayman but very common on Cayman Brac.

The **White-crowned Pigeon** breeds in the Florida Keys; on islands in the western Caribbean off the coasts of Mexico, Belize,

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152. Adult Yucatan Vireo *Vireo magister caymanensis*, Grand Cayman (this race is confined to that island), April 2010.

Honduras and Panama; in the Bahamas, the Greater Antilles south to Antigua, the Cayman Islands, and on some islands in the Lesser Antilles, where they are uncommon. The largest populations are in Cuba and the Bahamas. It has become increasingly scarce on the Cayman Islands, where the majority of the population are migrants arriving in late January or early February. Peak numbers occur from April to September, after which it is uncommon on Grand Cayman and often absent on Little Cayman and Cayman Brac. The species prefers mangrove and littoral shrubland but small groups breed in eastern Grand Cayman (and isolated pairs occur throughout the islands) in urban areas with tall trees. Flocks numbering thousands were observed at roosts in the 1980s but flock sizes had fallen to tens (rarely hundreds) by the late 1990s. Formerly thousands of birds were shot each year from 12th August when many were still feeding young in the nest, but the practice ceased when the NCL was passed, in 2013.

Yves-Jacques Rey-Millet

153. Adult Vitelline Warbler *Setophaga v. vitellina*, Grand Cayman, May 2011. Two of the three races of Vitelline Warbler are found in the Cayman Islands, including *S. v. vitellina* on Grand Cayman.

Restricted-range species A2

Five species with a range restricted to the West Indies have a disparate regional distribution with significant populations in the Cayman Islands. All are regularly observed in eastern Grand Cayman, east of Savannah. A decline in numbers in western Grand Cayman began in the 1990s and continued until the 2004 hurricane, when the vast majority (over 98%) of each species in this part of the island was lost; in 2016 all are absent or very rare. As development increases in the west and centre of the island, all are moving farther eastwards into remaining undeveloped forest and shrubland. One of the five, **Vitelline Warbler**, is discussed above.

Thick-billed Vireo has a disjunct distribution with five separate races. On the Cayman Islands *V. c. alleni* occurs in forest understorey, secondary woodland and inland dry shrubland on Grand Cayman and Cayman Brac; it is no longer found on Little Cayman. On Grand Cayman, the population has declined sharply since 1985 and it is now only locally fairly common in the central and eastern districts (Bradley 2000). On Cayman Brac, the population has declined in developed areas but remains stable on the bluff. This is also an A3 biome species.

Yucatan Vireo *Vireo magister* occurs on Grand Cayman, and on the coast of Mexico's Yucatan Peninsula and coastal islands of Belize and Honduras. Closely resembling the Black-whiskered Vireo, which has both sedentary and migratory races in the West Indies, *V. m. caymanensis* occurs throughout Grand Cayman east of Savannah, where it breeds in the upper levels of the dry and black mangrove forest.

Cuban Bullfinch (A2, A3) occurs only in Cuba and on Grand Cayman. Garrido *et al.* (2014) proposed that this species, the only member of the genus and which occurs on Cuba as *M. n. nigra* and on Grand Cayman as *M. n. taylori*, should be split into two separate island endemics: Cuban Bullfinch *M. nigra* and Taylor's Bullfinch *M. taylori* on Grand Cayman. In Bradley *et al.* (2006) it was listed as A2, A3, but if 'Taylor's Bullfinch' is recognised as a full species, it would be reclassified

A1, A2, as an island endemic for the Cayman Islands and a Near Threatened species of Global Concern. It is scarce to absent in Grand Cayman west of Savannah, where a decline in numbers began around 1990 in line with increased development/habitat loss, and was compounded by the 2004 hurricane. It is locally common in dry forest and shrubland of the central and eastern districts and is well represented in the protected IBAs.

Caribbean Elaenia *Elaenia martinica* is resident on various Caribbean islands and *E. m. caymanensis* occurs on all three of the Cayman Islands. It is common on Grand Cayman (but less conspicuous to the west of Savannah, and from late November to early January) and very common on Little Cayman and Cayman Brac. It favours tall, dry shrubland, where it is the most abundant landbird after the Bananaquit *Coereba flaveola*.

Biome species A3

The Cayman Islands form part of the Greater Antilles biome (NEO 07). There are six species with endemic races, all well represented in the IBAs. The first four species listed below were severely affected by Hurricane Ivan in 2004, taking five years to recolonise some areas and ten years to be seen regularly. All are frequently observed in the eastern half of Grand Cayman, east of Savannah, but their range is moving farther east as urban development removes their habitats. All are very uncommon or absent in western Grand Cayman.

Caribbean Dove *Leptotila jamaicensis* is restricted to Grand Cayman and Jamaica with a small population on San Andreas, off Central America (and it is introduced on New Providence, in the Bahamas). In Grand Cayman, *L. j. collaris* breeds in forested areas of the north and eastern half of the island; it has never been recorded in the west. **West Indian Woodpecker** occurs in Cuba, the Bahamas and on Grand Cayman; *M. s. caymanensis* was very common throughout Grand Cayman until the 2004 hurricane, but numbers are slowly recovering in the eastern half of the Island. **Loggerhead Kingbird** occurs in Cuba, the northern Bahamas, and the Cayman Islands; *T. c. caymanensis* inhabits forest and woodland on Grand Cayman and

Patricia Bradley

154. Booby Pond IBA, Little Cayman, July 2007. An important site for seabirds, where a large colony of Red-footed Boobies *Sula sula* breeds alongside Magnificent Frigatebirds *Fregata magnificens* on the landward side.

Cayman Brac. On Grand Cayman the population has recovered since Hurricane Ivan with the majority found east of Savannah. On Cayman Brac, it was never more than fairly common, and numbers have yet to recover from Hurricane Paloma, in 2008. It became extinct on Little Cayman after the 1960s (Johnston 1975). **Western Spindalis** breeds in the Bahamas, Cuba and Grand Cayman; *S. z. salvini* is fairly common in the eastern half of Grand Cayman – where it breeds in woodland/tall dry shrubland and forest edge and forages on fruits and berries in all habitats – but is now very uncommon to absent in western Grand Cayman. **Greater Antillean Grackle** occurs in the Greater Antilles and the Cayman Islands, where there are two endemic races: *Q. n. caymanensis* breeds on Grand Cayman, in large flocks in mangrove wetlands, and in small numbers throughout the island, including urban areas (numbers increased following Hurricane Ivan); *Q. n. bangsi* occurs on Little Cayman (it became extinct on Cayman Brac in the 1930s) and has become uncommon since Hurricane Paloma in 2008. Finally, **Red-legged Thrush** *Turdus plumbeus* breeds in Cuba, the Bahamas and on Cayman Brac, where *T. p. coryi* breeds throughout the island, retreating to forest on the bluff in the non-breeding season.

Colonial Seabirds A4 (ii)

The last population estimate of **Red-footed Booby** was in 1997; the 5,000 pairs or c. 20,000 birds were then >1% of the global population (Burton *et al.* 1999); two more-recent attempts at resurvey have been unsuccessful. The 2008 hurricane severely affected the vegetation on the landward (north) side of Booby Pond (KY007) resulting in the birds dispersing to new areas throughout the site and to some trees on roadside fringe on the south side of the pond. Recent estimates suggest lower numbers than previously but a repeat full survey is planned in 2016/17. Red-footed Boobies nest alongside a colony of **Magnificent Frigatebirds**, whose numbers fluctuate in the range of 350–800+ birds. When the number of breeding frigatebirds is high, the demand for nesting material causes them to raid booby nests, dislodging eggs and chicks and causing significant mortality.

IBAs in the Cayman Islands

There are four IBA site categories in the Cayman Islands: A1 sites (containing significant numbers of species of global concern); A2 sites (holding a significant number of restricted-range species breeding in a Secondary Area); A3 sites (holding a significant component of a group of species whose distribution is confined to one biome); A4 (i) sites holding >1% of the global population of a colonial waterbird and A4 (ii) sites holding 1% of the global population of a congrega-

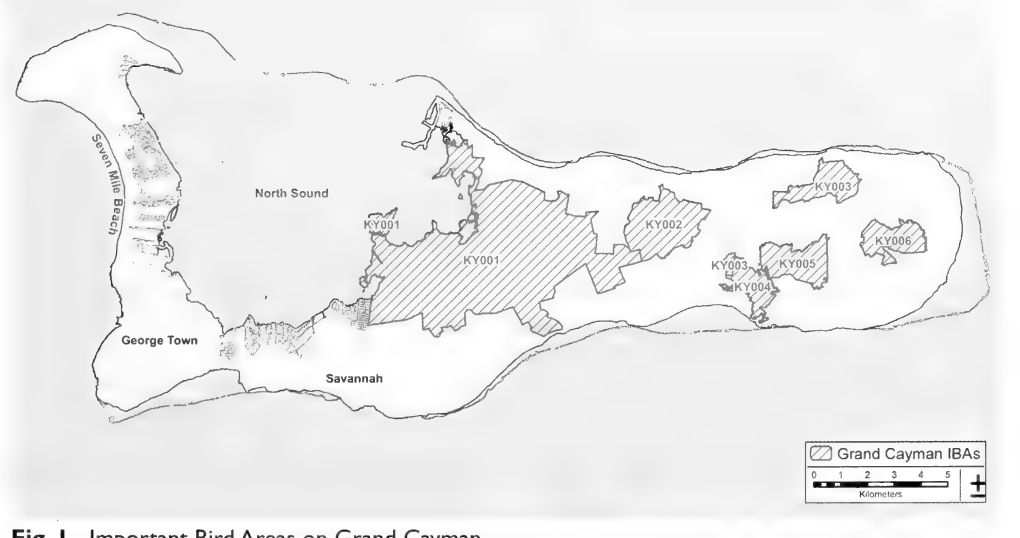

Fig. 1. Important Bird Areas on Grand Cayman.

Fig. 2 & 3. Important Bird Areas on Little Cayman and Cayman Brac.

tory seabird. See www.birdlife.org/datazone/info/ibacritglob for more details.

The Cayman Islands have ten IBAs: three on Little Cayman, one on Cayman Brac and six on Grand Cayman (figs. 1–3). All ten have been incorporated into the National Biodiversity Action Plan by the DOE as areas suitable for protection through the NCC (table 2 summarises the basic data for the sites and the key species involved). The present status of the sites shown includes new habitat protected since Bradley *et al.* (2006); threats and conservation issues relating to each site are discussed below.

Little Cayman: KY007 Booby Pond Nature Reserve (136 ha; 82 ha is a Ramsar Site and the whole site is protected and managed by the NTCI)

Two Globally Threatened species occur, West Indian Whistling Duck and Vitelline Warbler, and in addition there is one of the largest colonies of Red-footed Booby in the Caribbean. A major concern is the proximity of a proposed airport to the north of the booby colony; to buffer this threat, the NTCI purchased 18 ha of forest between the colony and the airport. The Booby Pond is the only Ramsar site in the islands, and attracts many migrant waterbirds, raptors and terrestrial migrants, especially warblers.

Little Cayman: KY009 Crown Wetlands (516 ha)

The Crown Wetlands comprise the entire area of coastal wetlands and saline lagoons on the island. Together with Booby Pond (above), this accounts for all the breeding habitat for West Indian Whistling Duck on the island. The Crown Wetlands support another 16 breeding taxa (including a mixed heronry), plus waterbird and terrestrial migrants in the extensive mangroves. When the National Conservation Law is finally brought into force in 2016, the NCC will propose that Crown-owned land is transferred to the NCC.

Little Cayman: KY008 Sparrowhawk Hill (152 ha)

This dry forest site supports the Near Threatened Vitelline Warbler as well as White-crowned Pigeon and Caribbean Elaenia. The NTCI owns 80 ha and, once funds become available, aims to purchase the rest of this privately owned site, presently under threat of development.

Cayman Brac: KY010 Bluff Forest (473 ha)

The NTCI owns the 187-ha Brac Parrot reserve, which is the main (and only protected) forest breeding habitat of this Near Threatened parrot. It also supports Vitelline

Warbler, plus four restricted-range and biome species: Thick-billed Vireo, Caribbean Elaenia, Loggerhead Kingbird and Red-legged Thrush. It is also important for migrant landbirds, especially warblers. The Brac Parrot is under severe threat and, unless immediate action is taken, it could become extinct within 7–10 years. The total area of bluff forest breeding and foraging habitat is 1,262 ha, which is being lost and fragmented at an unprecedented rate for new roads, housing and agricultural projects. The 2008 hurricane felled old established breeding trees and removed a significant extent of forest canopy.

Patricia Bradley

155. Mature dry forest on the Cayman Brac bluff, photographed in May 2007 before Hurricane Paloma (in 2008). This is typical habitat for the 'Brac Parrot' (plate 151).

Grand Cayman: KY002 Mastic Reserve (446 ha)
This is the largest contiguous area of dry forest, and is the most important biodiversity site, in the Cayman Islands. It is the main breeding area for the Near Threatened 'Cayman Parrot'; this reserve, together with three areas of dry forest in the eastern districts, comprises over 90% of the parrot's breeding habitat. A total of 23 taxa breed, including all the restricted-range and biome species and many terrestrial migrants occur. The site is bordered by developments and agriculture on its northern, eastern and southern sides and a proposed highway will cut through the southern and eastern boundary of the site. The NTCI is endeavouring to purchase more land on the adjoining Central Mangrove Wetland (KY001) to the west to create a larger protected area of forest and wetland. The Trust owns and manages 297 ha of the Mastic, which is also an important site for threatened endemic plants (Burton 2008), lepidoptera and reptiles (although not the endemic Blue Iguana *Cyclura lewisi*).

Grand Cayman: KY001 Central Mangrove Wetland (3,440 ha)
This site is comprised of four species of mangrove: Red *Rhizophora mangle*, Black *Avicennia germinans* and White Mangrove *Laguncularia racemosa* and Buttonwood *Conocarpus erectus*. Large saline lagoons include the protected Meagre Bay Pond. It forms the main breeding site for the West Indian Whistling Duck on Grand Cayman, supporting around 1,500 birds (Bradley *et al.* 2006). Some 'Cayman Parrots' breed in the remaining mature and dead Black Mangrove; until the 2004 hurricane, this was a major breeding area, and parrot density was estimated at 24 individuals/km^2 in 1986. In total, there are 22 breeding birds including three A3 species (table 2) and in some years a few pairs of Least Terns. It is a major wintering site for ducks, herons, shorebirds, raptors, as well as many warblers and other passerines. Already in 2016, the area of the CMW has been reduced to 3,440 ha with a number of

development projects either already underway (for example, large marl pits fringe the southern part) or planned (the proposed highway, see KY002 above, will remove a large band of land from east to west on the southern boundary). A large development is planned on the unprotected western boundary of the North Sound. The 690 ha of the western boundary with North Sound is protected as an Environmental Zone under the Marine Parks, and 309 ha is owned by the NTCI. The Crown owns 541 ha and the remainder of the site is in private hands, all potential areas for development. The site has long been proposed as a Ramsar site and this is a critical issue to be resolved.

Grand Cayman: KY003 Botanic Park and Salina

Botanic Park (50 ha) This contains all A1, A2, A3 species that occur on Grand Cayman; 50% of the site is owned by the NTCI and 50% by the Crown and thus it is considered entirely protected. A golf course with associated housing is being built along the northern boundary of the Park (part of the Frank Sound Forest, KY004), which raises issues of predation by dogs and invasion of the Green Iguana *Iguana iguana*. Fencing the Park has become a matter of urgency (about one quarter completed in February 2016) as dogs have killed several Blue Iguanas and are a threat to ground-nesting West Indian Whistling Ducks, as well as other birds.

Salina (260 ha) About 10–12% of the site is dry forest and protects two A1 species ('Cayman Parrot' and Vitelline Warbler), and all of Grand Cayman's A2 and A3 species. The NTCI has purchased 18 ha of additional land on the northern boundary.

Grand Cayman: KY005 Franklin's Forest, KY004 Frank Sound Forest, and KY006 Eastern Dry Forest

These sites comprise 250, 223 and 239 ha respectively of dry forest or 60% of the total forest area on Grand Cayman; all terrestrial A1, A2 and A3 species are represented. The sites are privately owned, unprotected and available for development. The protection of even part of these sites will be an expensive and long-term process since land can be purchased by the NCC only with the agreement of landowners and the release of funds.

Yves-Jacques Rey-Millet

156. Male White-crowned Pigeon *Patagioenas leucocephala* feeding on Red Birch *Bursera simaruba*, a staple tree that bears fruit in all months; April 2005.

Table 2. IBAs in the Cayman Islands, 2016. Species listed for each site include the trigger species for the IBA (in black) and important subspecies (in green).

island	IBA code	site name and area protected	A1	A2	A3	A4 (i)/(ii)	species
LC	KY007	*Booby Pond Nature Reserve*	●			●	West Indian Whistling Duck
		Wetland and dry forest				●	Red-footed Booby
		136 ha protected by NTCI	●				White-crowned Pigeon
		Ramsar site 82 ha		●			Caribbean Elaenia
			●	●			Vitelline Warbler
					●		Greater Antillean Grackle
LC	KY009	*Crown Wetlands*	●			●	West Indian Whistling Duck
		516 ha unprotected	●				White-crowned Pigeon
		(Crown property)			●		Greater Antillean Grackle
LC	KY008	*Sparrowhawk Hill*	●				White-crowned Pigeon
		152 ha dry forest		●			Caribbean Elaenia
		NTCI protected	●	●			Vitelline Warbler
CB	KY010	*Bluff Forest*	●				White-crowned Pigeon
		473 ha	●				'Brac Parrot'
		187 ha Brac Parrot reserve		●			Caribbean Elaenia
		protected by NTCI			●		Loggerhead Kingbird
				●			Thick-billed Vireo
					●		Red-legged Thrush
			●	●			Vitelline Warbler
GC	KY002	*Mastic Reserve*	●				White-crowned Pigeon
		446 ha			●		Caribbean Dove
		297 ha dry forest,			●		West Indian Woodpecker
		protected by NTCI	●				'Cayman Parrot'
				●			Caribbean Elaenia
					●		Loggerhead Kingbird
				●			Thick-billed Vireo
				●			Yucatan Vireo
			●	●			Vitelline Warbler
					●		Greater Antillean Grackle
					●		Cuban Bullfinch
					●		Western Spindalis
GC	KY001	*Central Mangrove Wetland*	●			●	West Indian Whistling Duck
		3,440 ha	●				White-crowned Pigeon
		690 ha protected by			●		West Indian Woodpecker
		Marine Parks	●				'Cayman Parrot'
		309 ha protected by NTCI			●		Loggerhead Kingbird
					●		Greater Antillean Grackle
GC	KY003	*Botanic Park and Salina*	●			●	West Indian Whistling Duck
		Botanic Park: 50 ha dry forest, 50% protected by NTCI. Salina: 260 ha herbaceous wetland, 10–15% dry forest; 100% protected by NTCI					As KY002 for landbirds
GC	KY005	*Franklin's Forest*					As KY002 for landbirds
		250 ha dry forest; unprotected					
GC	KY004	*Frank Sound Forest*					As KY002 for landbirds
		223 ha dry forest; unprotected					
GC	KY006	*Eastern Dry Forest*					As KY002 for landbirds
		239 ha dry forest; unprotected					

Patricia Bradley

157. Dwarf dry shrubland, eastern bluff, Cayman Brac, March 2014.

New proposals

Recognising the status of endemic races becomes essential when species, and in particular those on small islands, come under threat. Two issues of reclassification, the subject of recent research, could potentially have a significant impact on the importance of the Cayman Islands for threatened species.

First, Haakonsson *et al.* (in press) propose that the 'Brac Parrot' should be reclassified as Endangered, and that 'Cayman Parrot' should be reclassified as Vulnerable. The second proposal is that the Cayman Islands should be reclassified from a Secondary Area to an Endemic Bird Area by recognising two endemic species: the extinct Grand Cayman Thrush, and the reclassified 'Taylor's Bullfinch' (Garrido *et al.* 2014), which occurs only in the eastern half of Grand Cayman where much of this bird's habitat is unprotected and privately owned. If both proposals were accepted, the Cayman Islands would thus have one Endangered ('Brac Parrot'), two Vulnerable (West Indian Whistling Duck, 'Cayman Parrot') and three Near Threatened species (White-crowned Pigeon, Vitelline Warbler and 'Taylor's Bullfinch').

Populations of other species, with a wider range, are also significant in the Cayman Islands, however. For example, the loss of the Cayman races of Caribbean Elaenia and Yucatan Vireo would remove both species from the Greater Antilles. These examples emphasise the importance of considering the status of endemic races on small islands.

Threats to avian biodiversity in the IBAs and other areas

The incidence of endemic taxa in the Caribbean is among the highest in the world. Continued monitoring of endemic and resident birds is essential and is especially relevant on the Cayman Islands where rapid human population growth and uncontrolled development threaten to outstrip limited natural resources. On Grand Cayman, current environmental threats include the loss and fragmentation of forest, air and groundwater pollution, coral reef degradation and damage to the coastline. Even without habitat loss, endemic birds on small islands face a precarious existence owing to their limited range (Vitelline Warbler, Cuban Bullfinch); small population size (Cayman and Brac Parrots, and Greater Antillean Grackle on Little Cayman); climate (the 2004

and 2008 hurricanes had profound effects on avian diversity); and, for some species, the need for specific climax habitats (parrots, for example, are dependent on mature forest trees). Good knowledge of the main limiting factors, combined with species monitoring and habitat preservation, is the only route to ensure the future of the Cayman Islands' birds. Some of the problems, and potential solutions, are explored below.

Human development

Lack of resource planning is a major problem when planning a Protected Areas System. An out-of-date Development Plan for Grand Cayman, with no environment overlay, and rejected Development Plans for the other islands means that there is no strategic plan for the islands. Consequently, a new Development Plan for the entire Cayman Islands is an urgent requirement. A new Planning Law is also required, as is better enforcement of existing laws and regulations, since the chief threats to species are anthropogenic, in particular habitat loss and fragmentation as pressure from development grows.

Land purchase and management is the only way to protect avian habitats securely. Armed with a new law, the NCC can now recommend Crown land for protection and it can request funds from the EPF to purchase privately held land when offered for sale, with the aim of securing a comprehensive Protected Areas System. The NCC can also make Conservation Agreements with private landholders. In addition, the first joint acquisition by RSPB with a UKOT partner (NTCI) aims to extend the Brac Parrot Reserve by purchasing 70 ha of forest on the eastern boundary of the current reserve – which is a vital step forward.

Invasive species

Invasive and introduced species are one of the greatest threats to native wildlife on small islands generally and the uncontrolled nature of the cagebird trade is a particular problem in the Cayman Islands. Currently, potential pest species can be imported and sold legally; many escape or are released on a regular basis on Grand Cayman. Two species presently breed: Monk Parakeet and Yellow-crowned Amazon. The Monk Parakeet spread rapidly throughout the island during 2000–04, so much so that a DOE control project was initiated. That project, together with Hurricane

Yves-Jacques Rey-Millet

158. Male Cuban Bullfinch *Melopyrrha nigra taylori* feeding on the flowers of Logwood *Haematoxylum campechianum*, February 2010.

Ivan in 2004, sharply reduced numbers to a small residual population (which is now monitored by the Terrestrial Research Unit).

The invasive Green Iguana has no natural predators and has become a major pest. Its current estimated population is 290,000 individuals on Grand Cayman, and there is mounting evidence that this 'vegetarian' also takes birds' eggs and fledglings. After receiving a grant from the EPF, the Invasive Species subcommittee of the NCC is funding a pilot project for iguana control, as well as addressing biosecurity on Little Cayman and Cayman Brac to prevent it becoming established there.

Climate change

Sea-level rise is a major threat to low-lying areas of the islands. Saltwater inundation of the extensive mangrove system will cause the coasts to 'migrate' inland, displacing breeding and wintering habitats for birds. Ocean acidification is already affecting growth rates of coral reefs and, ultimately, the fish populations on which resident seabirds depend. A changing climate means that stronger hurricanes are predicted to occur in the region with increased frequency of Category 3–5 tropical systems. The Climate Change subcommittee of the NCC is working through the DOE to influence government policy and provision for such weather events.

In an ecosystems study of the CMW and Mastic Forest, Childs *et al.* (2016) discussed the benefits of these two sites in terms of storm protection, regulation of overland water flow and nutrient run-off, and carbon storage, as well as tourism. Both sites stored appreciable amounts of carbon; for example, destruction of 5% of the CMW would emit 340 million kg of CO_2e. The clear conclusion was that both sites are critical to the well-being of the Cayman Islanders and the terrestrial and marine biodiversity.

Hunting

Illegal hunting has declined, including for the West Indian Whistling Duck, but continues to threaten both races of Cuban Amazon, which are still shot as crop pests and trapped for pets in some areas. Only one prosecution has ever been brought. An amnesty for caged parrots is proposed in 2016 with all captive birds ringed and fitted with a microchip before a moratorium is brought in.

Seabirds

Although they are protected from hunting,

Patricia Bradley

159. The Salina IBA, Grand Cayman, May 2012; the largest herbaceous wetland in the islands.

some breeding seabirds, in decline throughout the region, have no protected sites, and breed outside the IBAs, including White-tailed Tropicbird, Brown Booby, Least Tern and Bridled Tern (Bradley 2009). The NCC has proposed that the face of the Bluff on Cayman Brac (Crown land) should be protected as nesting habitat for the tropicbird and booby; and the bluff at Pedro, Grand Cayman, for the small population of the tropicbirds. The breeding cay of the Bridled Tern is scheduled for protection under the proposed Marine Protected Area at Barker's, on Grand Cayman. Unfortunately, Least Terns do not currently breed in any IBAs; the species prefers to breed on spoil banks at the many development sites on Grand Cayman, and habitually succumbs to development, predation or flooding in the May rains. There are no confirmed breeding records on Little Cayman or Cayman Brac since 2010.

Non-breeding migrant birds

Since there are no long-term ringing projects, the status of migrants and vagrants in the Cayman Islands is based mainly on regular counts at sample sites on all three islands, and on data from the literature and museum specimens. The increasingly rapid loss of tropical forest is at least partly responsible for a long-term decline in the total number of migrant songbirds. The position of the Cayman Islands, close to the boundary of the Caribbean Sea and the Gulf of Mexico at the western edge of the Greater Antilles and midway between the North and South American continents, accounts for the greater part of its avifauna occurring as non-breeding migrants. The great majority breed in the Nearctic and winter in the Neotropics. More than half of the migrant species recorded are observed annually, either overwintering or on passage.

Migrant birds use three main routes: the Mississippi flyway and across the Gulf of Mexico; the Atlantic flyway via Florida and the Greater Antilles; and the Atlantic seaboard through the Bahamas into the Antilles. Some are known to travel to the western Caribbean from the Yucatan Peninsula. More species and more individuals are recorded in autumn than in spring reflecting the prevailing winds and the fact that many species return northwards via the Middle American land route, thus bypassing the western Caribbean.

Autumn migration extends from July to early December, with peak numbers between mid September and mid October. The earliest wintering migrants leave in February, and the latest in May. Peak spring migration is generally from mid March to early April. The majority of migrant landbirds are insectivores on their breeding grounds (swifts, flycatchers, vireos and warblers) but tend more towards omnivory in the tropics, consuming an increased amount of fruit and seeds.

Some regular migrants are recorded in all months, either as short-stay passage migrants (e.g. Wilson's Plover *Charadrius wilsonia*, Laughing Gull *Larus atricilla* and Barn Swallow *Hirundo rustica*) or where a few

Yves-Jacques Rey-Millet

160. Male Western Spindalis *Spindalis zena salvini*, Grand Cayman, October 2009. This represents one of two genera endemic to the Greater Antilles (the other is *Melopyrrha* – see plate 158).

Yves-Jacques Rey-Millet

161. Female West Indian Woodpecker *Melanerpes superciliaris caymanensis* is confined to Grand Cayman; April 2011.

immatures or non-breeding adults remain through the summer after the majority have migrated (e.g. Brown Pelican *Pelecanus occidentalis*, Night Heron *Nycticorax nycticorax*, Great White Egret *Ardea alba*, Glossy Ibis *Plegadis falcinellus*, Turnstone *Arenaria interpres* and Semipalmated Sandpiper *Calidris pusilla*). For others (mostly shorebirds, some warblers and other passerines), the greatest numbers occur on passage, with few overwintering. Several species occur on passage only, such as White-rumped Sandpiper *C. fuscicollis* and Blackpoll Warbler *Setophaga striata*. Some species make a trans-Gulf migration to winter in Middle America and pass through the Cayman Islands much more frequently in autumn (e.g. Red-eyed Vireo *Vireo olivaceus*, Swainson's Thrush *Catharus ustulatus* and Kentucky Warbler *Geothlypis formosa*). Irruptive migrants such as Yellow-rumped Warbler *S. coronata* and Cedar Waxwing *Bombycilla cedrorum*, are exceptionally abundant in some years, rare or absent in others.

For some species that regularly winter in the Greater Antilles (e.g. Spotted Sandpiper *Actitis macularius*, American Redstart *S. ruticilla*), a late spring passage from farther south is noticeable after the wintering birds have left. Other species (e.g. Yellow-bellied Sapsucker *Sphyrapicus varius*, Palm Warbler *Setophaga palmarum*) arrive in the autumn, winter in the islands and return north in the spring, and no separate passage is observed.

Longer-term trends (over 35 years) in abundance of migrants reflect the changing status on the Nearctic breeding grounds, for example Swallow-tailed Kite *Elanoides forficatus* and Peregrine Falcon *Falco peregrinus*, both rare in the 1980s, are now regular on passage, reflecting increased populations on northern breeding grounds. The conservation success of the Peregrine – some now also overwinter – has come at a cost to the tropicbird and heron populations, which provide its main prey, and has also affected the breeding success of Brown Boobies on Cayman Brac. Other species (e.g. Blue-grey Gnatcatcher *Polioptila caerulea* and Savannah Sparrow *Passerculus sandwichensis*), regular in the 1980s, are now rare due to declines on the breeding grounds.

North American wood-warblers represent the majority of northern passerine migrants with 34 of the 50 known species recorded. The most common are Ovenbird *Seiurus aurocapilla*, Worm-eating Warbler *Helmitheros vermivorum*, Northern Waterthrush *Parkesia noveboracensis*, Black-and-white Warbler *Mniotilta varia*, Common Yellowthroat *Geothlypis trichas*, American Redstart, Cape May Warbler *Setophaga tigrina*, Northern Parula *S. americana*, Black-throated Blue Warbler *S. caerulescens*, Palm Warbler, Yellow-throated Warbler *S. dominica* and Prairie Warbler *S. discolor*. All except the terrestrial Palm Warbler prefer habitats occupied by the two resident warblers, Vitelline and Yellow Warbler *S. petechia*. The high density of migrants in winter almost certainly affects the resident species, and may be the reason why only two species are resident in the Cayman Islands.

Vagrants and rare visitors

A large number of migrants are vagrants (fewer than ten records each), reflecting the small size of the island group and its geographic position. Vagrants include North American migrants that are regular in the Bahamas and Greater Antilles between August and May (e.g. American Bittern *Botaurus lentiginosus*); species that breed elsewhere in the Greater Antilles (e.g. Audubon's Shearwater, Eastern Meadowlark *Sturnella magna*); and species that occur only after the passage of tropical storms in autumn or a cold front in spring, when they are blown off their usual migration route, such as Buff-breasted Sandpiper *Calidris subruficollis*, and predominately Middle and South American species such as Tropical Kingbird *Tyrannus melancholicus* and Fork-tailed Flycatcher *T. savana*.

Other taxa

The long-term conservation effort to save the critically endangered Blue Iguana from extinction is a major success for the NTCI, under the control of Fred Burton until 2014. The breeding programme is managed at the Botanic Park, and there are release sites at the Park and the Salina (KY003). The main site is now (from 2015) the 195-ha Collier's Wilderness Reserve, in eastern Grand Cayman, leased by the NTCI from the Government. The site is also significant as it protects threatened dry shrubland habitat.

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Behavioural thermoregulation in the Common Swift during flight

Christian Neumann

Abstract For the Common Swift *Apus apus*, which spends most of its life on the wing, thermoregulation during flight should be particularly important. For the first time, evaporative and non-evaporative thermoregulatory behaviour, chiefly trailing the legs but also gaping, were observed in flight; these are described and illustrated. At ambient temperatures exceeding 30°C, almost all Swifts observed were trailing their legs below the body; gaping (opening the bill) was also observed but less frequently. Leg trailing increases drag and thus represents a trade-off between optimal flight performance and cooling.

Like no other bird family, swifts are adapted to life on the wing. In fact, the Common Swift *Apus apus* (hereafter the Swift) spends the majority of its life in the air. Hunting, drinking, bathing and even nocturnal roosting take place while flying (Weitnauer 1952; Bäckman & Alerstam 2001; Lentink *et al.* 2007; Henningsson *et al.* 2009). Young Swifts spend almost two years on the wing without a break before they start breeding for the first time, in their third year (Glutz von Blotzheim & Bauer 1994). It is no wonder that these fast-flying birds show a number of morphological, physiological and behavioural adaptations to their airborne mode of life. The torpedo-shaped body is perfectly streamlined, the forked tail is short, and the curved, scythe-like wings are characterised by a short but powerful 'arm' and a long 'hand', with very long primaries. The feet of Swifts are proportionately smaller than those of most other birds, while the legs are short with a feathered tibia and a partially feathered tarsus. All four toes are unfeathered, each equipped with a powerful talon. Inappropriate for walking, the toes are used for

Christian Neumann

162. The observation point, in the Schöneberg district of central Berlin, August 2014.

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Christian Neumann

163. At moderate ambient temperatures, Common Swifts *Apus apus* fly with their legs retracted and hidden in the feathers of the vent to maintain an optimal aerodynamic body profile.

clinging to vertical surfaces at the nesting sites. During flight, the legs and toes are normally tucked up, hidden deep within the plumage of the vent, to achieve an optimal aerodynamic body shape. Indeed, the scientific name for the family 'Apodidae' means 'without feet' when translated from Ancient Greek (Glutz von Blotzheim & Bauer 1994; Chantler 1999).

Birds are endotherms (animals dependent on or capable of generating heat internally), which means that they tend to maintain their body temperature within certain limits. Other than at ambient temperatures, maintaining a constant body temperature makes a steady demand either on the biochemical processes of heat production or on the physical mechanisms of heat loss. To enable the body temperature to remain constant, a number of physiological and metabolic mechanisms and behaviours are necessary. For instance, the insulation properties of the feathers and lower metabolic rates are effective protection against low temperatures. Unlike most mammals, birds have no sweat glands, so evaporation as a way to counter overheating and to lose heat can occur only via the respiratory system, particularly by panting: breathing with an open bill (gaping) leads to evaporation and a subsequent fall in temperature in the mouth area. In many bird species, the effect of panting is supported by gular fluttering (Bartholomew *et al.* 1968; Dawson 1982; St-Laurent & Larochelle 1994). Another mechanism of heat loss is dissipation via unfeathered parts of the body – particularly the legs and the head – which are known to serve as efficient heat 'radiators' (Kahl 1963; Steen & Steen 1965; Ward *et al.* 2008). Leg trailing has been described for several passerine and non-passerine bird species – including pigeons (Columbidae), bee-eaters (Meropidae) and starlings (Sturnidae) – as a thermoregulative behaviour during flight (Frost & Siegfried 1975; Baudinette *et al.* 1976; Torre-Bueno 1976; Bryant 1983; Martineau & Larochelle 1988;

Christian Neumann

164. When ambient temperatures exceed 30°C, Common Swifts *Apus apus* may be observed flying with the legs trailing down from the body, and the toes well spread.

Ward *et al.* 1999). Such leg-trailing behaviour is thought to be especially important for birds inhabiting open areas, where there are limited opportunities to seek shade from the sun's heat (Bryant 1983). For Swifts, living permanently on the wing and thus particularly exposed to solar radiation, behavioural thermoregulation during flight would be expected to be extremely important. Both leg trailing and panting have been studied in the Common Swift and, apart from a brief note by the author (Neumann 2015), are described in detail and illustrated here for the first time.

Study area and methods

Leg-trailing behaviour in the Common Swift was first noticed by the author by chance during a hot summer day in Berlin, Germany, in 2012. In subsequent years (2013–15), more systematic observations of this phenomenon were carried out. The study was undertaken in the Schöneberg district of central Berlin. Observations were made from the roof of an apartment building (22 m above ground), which provided all-round visibility of the adjacent skies (plate 162). Swifts breed commonly in central Berlin, and the distance from the vantage point to the nearest breeding colony is about 150 m. Up to 60 Swifts at any one time were counted during each observation session, using the air space around the observation point for hunting and social display flights. Observations were carried out in May, June and July. Since Swifts tend to fly at higher elevations in the middle of the day, most observations were made in the morning and evening (predominantly about two hours after sunrise and before sunset) but were occasionally carried out during the middle of the day as well. Owing to their speed of flight, close observations of Swifts with the human eye are almost impossible, so all the Swifts passing within close range of the observation point (approximately within 50 m) were counted and photographed using a full-frame digital SLR camera and a 400 mm f/5.6 telephoto lens. To achieve sufficiently sharp images, shutter speeds of 1/2000 s or faster were used. Post-processing of the digital images included cropping and tonality adjust-

ments to reveal details. Only images showing the bird's ventral side or body profile were considered. Image analyses included the registration of leg trailing and gaping. Air temperatures during the observation periods were measured to an accuracy of 1°C using a standard thermometer.

Christian Neumann

165. The legs can be trailed to a level so that the whole tarsus is exposed.

Results

The results of the field observations are summarised in table 1. Observations were made on 29 days with a total of 31 hours of observation (mean observation time/day: 1.06 hours). During this time, separate observations of 1,511 flying Swifts were made and suitable photographs obtained. The majority of observations were made in July (16 days) followed by June (eight days) and May (five days).

On three observation days (27th July 2013, 17th and 22nd July 2015) the ambient temperature during the observation period was 30°C or higher. This corresponded exactly with the days when leg trailing was noted. On 27th July 2013, leg trailing was observed on 95% (93/98) of all photographed flying Swifts; on 17th July 2015, leg trailing was performed by 96% (68/71); and on 22nd July 2015 by 91% (59/65) of all photographed individuals where either the belly or the body profile was visible. At lower ambient temperatures, Swifts always flew with their legs retracted and the feet hidden in the body feathers (plate 163). At temperatures above 30°C, most Swifts were observed with their feet extending down below the body, mostly with the toes well spread (plate 164). On many occasions, the legs were extended to the extent that the whole tarsus was also exposed (plate 165). On two of the days when leg trailing was observed, gaping was also recorded, albeit to a much lesser extent: on 27th July 2013 and 17th July 2015, some birds (4% and 12%, respectively) flew with their bill slightly open, a behaviour otherwise not observed (plate 166). At moderate ambient temperatures, all Swifts tend to fly with the bill closed; it is opened only for foraging and vocalisations (plate 167).

Discussion

Unfeathered parts of hind limbs serve as heat radiators

The important role of unfeathered parts of birds' legs in non-evaporative thermoregulation (i.e. convection and radiation) was described by Steen & Steen (1965) and Baudinette *et al.* (1976). The toes of the Common Swift are unfeathered, while the tarsus is thinly feathered at the front and unfeathered at the rear. At ambient temperatures exceeding 30°C, the toes and the tarsi are typically trailed and the toes are spread to increase the surface area exposed to the wind. This confers a sensitive mechanism to regulate heat loss through behavioural control of the heat exchange area. These observations were confirmed by wind tunnel experiments using Feral Pigeons *Columba livia* (Biesel & Nachtigall 1987). The researchers concluded that birds' legs fulfil all the requirements for an effective, well-controlled heat-loss system.

The trade-off between optimal flight performance and the cooling effect

Leg trailing increases drag during flight. This

Table 1. Observations of behavioural thermoregulation (leg trailing and gaping/bill opening) in the Common Swift *Apus apus* in Berlin, Germany, 2013–15.

date	observation time (UTC+2)	duration (minutes)	max. temp (°C)	no. birds photographed	leg trailing	gaping
17.05.2013	19.21–20.37	76	24	48	0	0
19.06.2013	05.18–08.13	175	19	95	0	0
21.06.2013	20.56–21.19	23	22	17	0	0
22.06.2013	20.40–21.17	37	23	35	0	0
02.07.2013	20.13–21.03	50	20	35	0	0
04.07.2013	20.21–21.23	62	20	52	0	0
09.07.2013	06.12–08.21	129	18	92	0	0
17.07.2013	07.49–08.34	45	19	39	0	0
26.07.2013	07.25–07.50	25	20	19	0	0
27.07.2013	10.34–12.21	107	33	98	93	4
19.05.2014	18.27–20.51	144	20	112	0	0
21.05.2014	19.56–20.18	22	26	21	0	0
22.05.2014	07.30–08.18	48	19	35	0	0
26.05.2014	19.08–20.01	53	24	44	0	0
04.06.2014	19.39–20.54	75	22	60	0	0
26.06.2014	07.49–08.17	28	16	17	0	0
02.07.2014	07.38–08.31	53	16	29	0	0
12.06.2015	17.38–20.03	145	26	98	0	0
24.06.2015	20.36–21.05	29	15	19	0	0
25.06.2015	15.44–17.00	76	23	46	0	0
01.07.2015	20.55–21.22	27	24	20	0	0
02.07.2015	20.35–21.12	37	27	29	0	0
07.07.2015	07.04–07.47	43	27	55	0	0
16.07.2015	19.38–20.38	60	24	49	0	0
17.07.2015	19.22–20.04	42	30	71	68	9
18.07.2015	06.07–07.17	70	18	62	0	0
21.07.2015	19.33–20.43	70	22	78	0	0
22.07.2015	13.26–14.39	73	30	65	59	0
23.07.2015	07.39–08.56	77	23	71	0	0

is particularly significant for Swifts, which are extremely fast-flying and habitually aerial birds, able to glide at an average speed of 11 m/s (Videler *et al.* 2004) and to fly twice as fast (20.9 m/s during social display flights and up to 31.1 m/s for shorter periods; Oehme 1968; Bruderer & Weitnauer 1972; Henningsson *et al.* 2010). Swifts have evolved a perfectly streamlined body profile with low drag to match the aerodynamic needs for high-speed flying (Lentink *et al.* 2007). Leg trailing should therefore represent a trade-off between optimal flight performance and effective heat dissipation. The fact that Swifts accept the disadvantages in flight speed and manoeuvrability emphasises the need for thermoregulation during flight and the importance of legs and feet for heat dissipation.

Leg trailing vs panting

Why was panting behaviour observed much less frequently than leg trailing in this study? Two different explanations for this are suggested. First, high-speed flight with the bill wide open would be disadvantageous because of the high risk of unwanted detritus entering the mouth. Second, evaporative thermoregulation by panting should be avoided by birds living in hot and arid environments since there is an increased risk of water loss and dehydration (Torre-Bueno 1976; Dawson 1982; Biesel & Nachtigall 1987; Carmi *et al.* 1992). The breeding range of the Common Swift includes many areas with hot summer temperatures, for example southern Europe, parts of North Africa and the Middle East (*BWP*). Moreover, Swifts spend two-thirds of their life in the hot regions of equatorial and subequatorial Africa and therefore it seems likely that leg trailing is the preferred method of thermoregulation compared with panting. It is assumed that Swifts first developed this

Christian Neumann

166. In addition to leg trailing, thermoregulation can be enhanced by gaping, with the bill slightly open.

behaviour in the warmer regions of their range and then used it in more temperate breeding areas when their range expanded northwards after the last glaciation.

Potential conflict with ringing

Legs are important thermoregulatory organs not only for Swifts but also for many other species, both non-passerines and passerines. For species that habitually use the legs for thermoregulation, the use of multiple colour rings on the tarsi may hamper convective heat loss of the covered skin surface. It is likely to be a problem mainly for species such as the Swift, which is airborne with the legs retracted for such a high proportion of daylight hours. Using a simple experimental design to explore this potential problem would be worthwhile.

Acknowledgments

I am very grateful to my colleague Jason Dunlop for correcting the English version of the manuscript.

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Christian Neumann

167. At moderate ambient temperatures, swifts open their bill only for foraging or vocalisations (as here).

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Short papers

Sexual dimorphism of acoustic signals in the Common Swift

Abstract The typical screaming calls of the Common Swift *Apus apus* include a scream followed by a trill. The pitch and the duration of the different parts of the calls produced by breeding birds in nestboxes vary within and between individuals; these differences do not signify the bird's sex and probably depend largely on the degree of agitation of the individual. However, the trill part of the screaming call is a reliable indicator of a bird's sex. Female Common Swifts show an average time lapse between the trills of ≥25 ms, whereas that of males is ≤20 ms. The modulation frequency at the end of the screaming call of females is ≤40 Hz, whereas that of males is ≥50Hz.

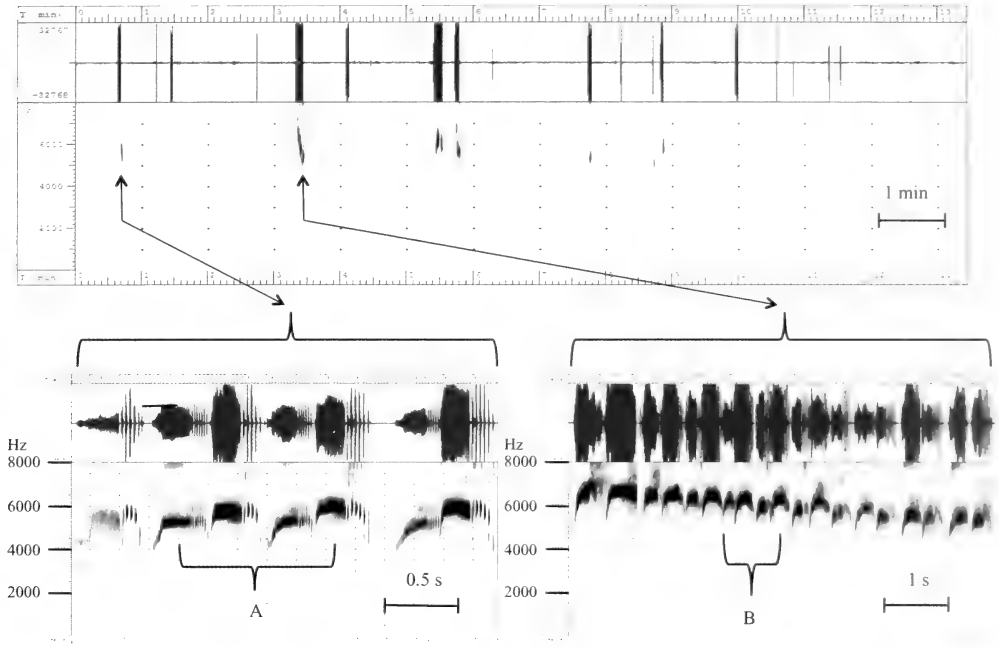
Richard Allen

Introduction

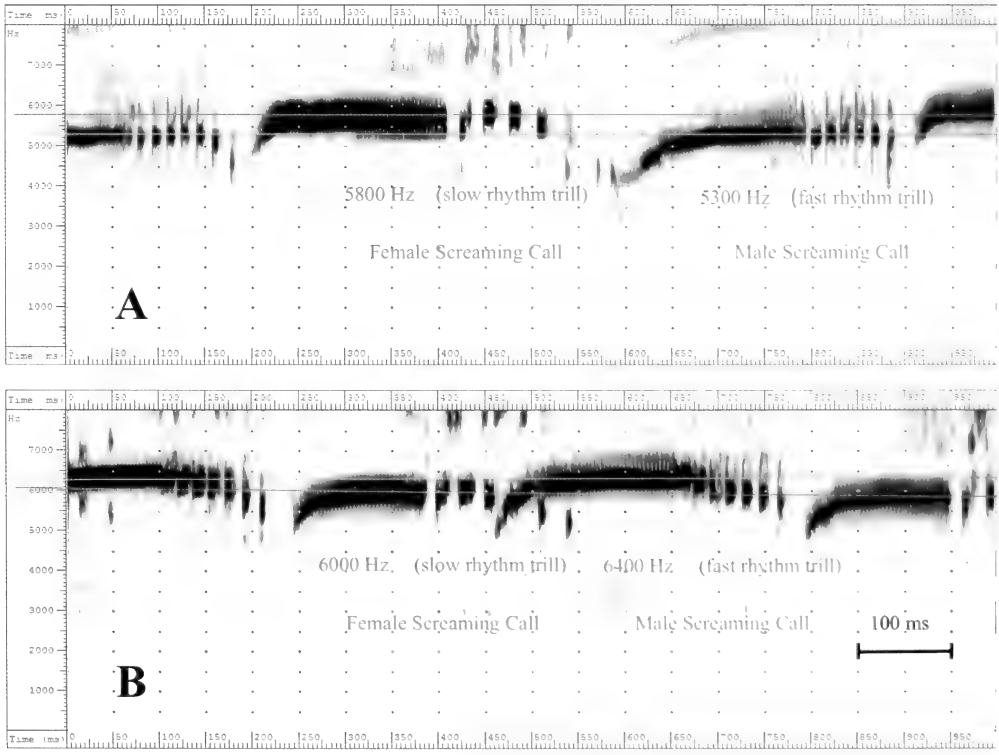
There is little published research on the vocalisations of the otherwise well-studied Common Swift *Apus apus* (e. g. Malacarne *et al.* 1989, Bretagnolle 1993, van Oudheusden 2006). It has long been known that duetting is typical of the species at the nest site (see for example Lack 1956), during which the members of a pair call alternately, giving rise to the *swee-ree* call. In a paper published in *BB*, Kaiser (1997) reported that the call of the female sounds a little higher-pitched and that of the male lower-pitched; he considered that these differences were an acoustic signal that the birds used to distinguish the sexes. Bretagnolle (1993) showed that the screaming call always includes two parts: a scream and a trill. He recognised that one member of a pair has a faster trill rhythm and suggested that this varied between the sexes, with males having a faster trill. This study investigates the duetting calls of breeding Common Swifts by quantitative spectrographic methods.

Materials and methods

In 2013 and 2014, three pairs of Common Swifts nesting in Gießen, central Germany, were studied in nestboxes that allowed access from the rear. Each member of the pair was marked identifiably using a tiny amount of paint on the wing-tip. The sex of individuals was confirmed by filming the egg-laying



Figs. 1 & 2. Sequences of duetting screaming calls from a breeding pair of Common Swifts *Apus apus*, caused by the approach of non-breeders to the nestbox. The insets (above) and fig. 2 (below) show in more detail the same vocalisations at the start (2A), and then in the third minute (2B) of the duetting.



process. Their screaming calls were recorded digitally and the recordings analysed. Vocalisations were recorded by microphone capsules which had a frequency spectrum of 20–16,000 Hz (KPCM-G60H50P-44DB-1185) and a digital recorder (Olympus LS-11). The sounds were analysed by different programs (SFS/WASP Version 1.54 and SFS/ESECTION of Mark Huckvale: University College London, Raven Pro 64 1.4 and SRLab).

Results and evaluation

An analysis of duetting

Duetting, or alternate calling, occurs regularly at the nest when both members are present, and in situations such as that when non-breeders ('bangers') bang at or scream into occupied sites. Duetting appears to be a function of defence of the breeding site (Kaiser 1997; Bergmann 2014). Bretagnolle (1993) suggested that duetting is individually distinctive and has a territorial function as well as being important for recognising an individual or partner.

Fig. 1 shows a sequence of duetting screaming calls from a breeding pair in this study. During a 13-minute period, duetting was provoked repeatedly by non-breeders calling at the nestbox, and with increasing intensity. The insets A and B show the detail of duetting at the beginning and again three minutes later. Fig. 2 shows in greater detail the sequences marked in fig. 1.

At the beginning of the sequence, the male's calls (blue line, fig. 2A) were 500 Hz lower in frequency than those of the female (red line). After repeated approaches from the intruder, the intensity and duration of the duetting by the pair in the nestbox increases. Yet whereas the female's calls show only a slight increase in frequency, of at most 200 Hz, the frequency of the male's screaming call increases by about 1,100 Hz and thus exceeds that of the female by 400 Hz (fig. 2B). The duration of the screaming calls of the two pair members varies a great deal. In the duets at the beginning, the screaming calls of the female are clearly longer than those three minutes later. As the duetting progresses, the screaming calls of both partners become more similar, in terms of both duration and frequency. Yet the differences in the interval between the single trills during the terminal part of the calls remain the same.

Fig. 3 shows an example of the frequency of the screaming calls declining towards the end of a period of duetting. In this case, the sequence starts at 6,700 Hz but by the end,

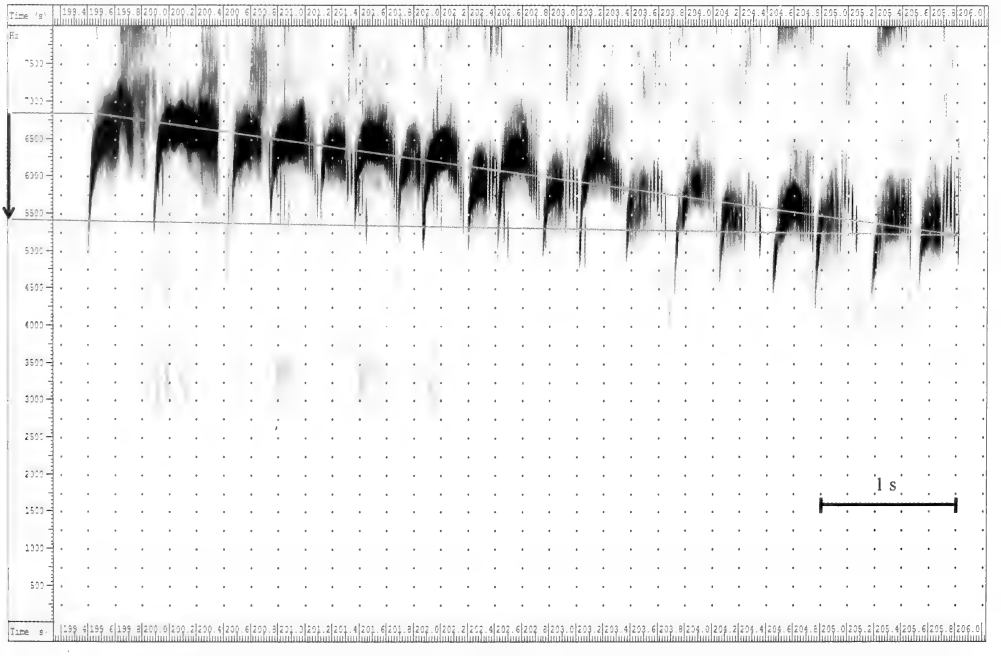
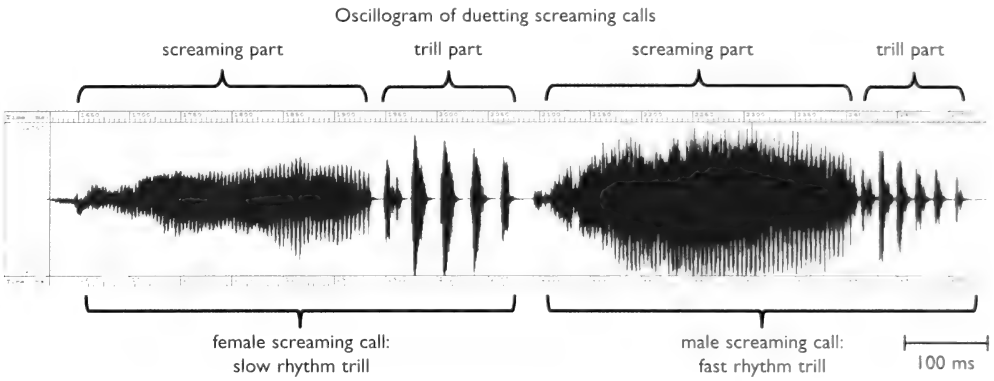


Fig. 3. Frequency shift during the duetting of Common Swifts *Apus apus*.



sequence of syllables within the trill part	breeding pair						
	pair 1		pair 2		pair 3		
	female	male	female	male	female	male	
mean distance between the trills	26.9	17.9	29.8	18.1	29.1	16.7	ms
standard deviation	±2.3	±1.3	±1.8	±1.1	±1.2	±0.8	ms
number of screaming calls	35	27	53	36	34	20	n
modulation frequency	37	56	34	55	34	60	Hz

Fig. 4. Codifying the sex of Common Swifts *Apus apus* in the trill part of the screaming call: trill parts of higher frequency indicate males and of lower frequency indicate females.

with reduced levels of agitation – after the non-breeders have left – the pitch of the screaming calls is around 5,250 Hz.

These patterns were validated by recordings of another pair of Swifts in the study. In this case, the male started the duet with a frequency 250 Hz higher than the female yet, in the course of the duet, the frequencies became more and more alike. The sex-specific distinguishing feature of the calls appears not to be frequency, as suggested by Kaiser (1997). In fact, the variation in both the duration and intensity of the calls reflects the agitation of the birds rather than which member of the pair is calling.

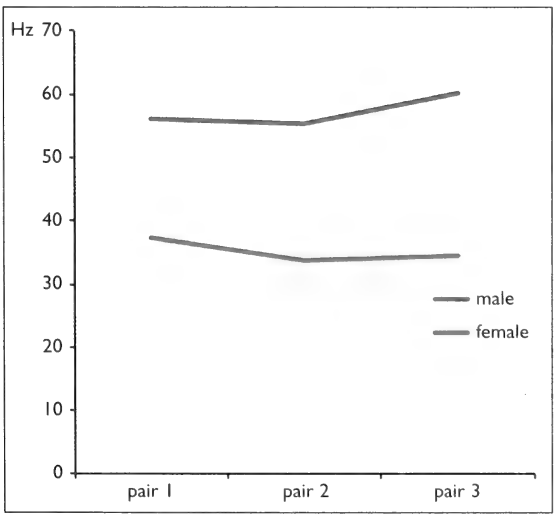


Fig. 5. Modulation frequency in the trill part of the screaming calls of three breeding pairs of Common Swifts *Apus apus*.

Variation between males and females

The key difference between males and females appears to be in the trill part of the call. The frequency of the screaming call – which serves as the carrier frequency – is modulated by a low frequency – the sequence of the trills. This indicates a frequency modulation akin to that used in, for example, ultra high-frequency radio engineering. Measuring the temporal sequence of the trill part of the calls showed that, for the pairs of Common Swifts in this study, the frequency of the trill was 34–37 Hz for females and 55–60 Hz for males (figs. 4 & 5).

An analysis of duetting during fighting

At 18.30 hrs on 12th May 2014, a third Common Swift entered one of the study nestboxes; the weather was fine and the intruder was not seeking shelter from cold conditions. At the time, the female

was sitting in the nestbox and immediately attacked the intruder at the entrance. After half an hour the female left the intruder alone and sat on the nest scrape. At about 19.40 hrs the male returned to the nestbox; he ignored the intruder, which remained at the entrance hole, in a state that resembled paralysis. Shortly afterwards, the breeding pair began to concentrate on pair grooming at the nest scrape. At 20.03 hrs the female suddenly attacked the intruder (which had seemingly become more relaxed, preening its feathers). A short, intense fight between the female and the intruder began, accompanied by duetting by the fighters. At about 05.30 hrs the following morning there was another fierce fight between the female and the intruder and, finally, the latter left the nestbox. Spectrographic analysis indicated that the intruder was a male, with trill modulation 53 Hz (sd=±3.2, n=38). The pitch of the individual screaming calls in the duet of the fighters was of almost similar frequency, around 6,000 Hz. The male completely ignored the fight. This evidence is contrary to Kaiser's (1997) finding that fights occurred only between Swifts of the same sex. Whether this observation was a one-off incident or whether fights occur more generally between individuals of different sexes needs further study.

Discussion

This study shows that the great variation in pitch of duetting screaming calls, both within and between individuals, is greatly influenced by the level of agitation of the birds and cannot be used reliably to establish the sex of a Common Swift. Kaiser's (1997) finding that the female emits a slightly higher tone in the duet (*swee*) and the male a slightly deeper tone (*ree*) was not confirmed. His conclusion may have arisen from the method used, which was based on human acoustic perception, rather than by analysing spectrograms. The sound impression to the human ear could have been influenced by the c. 190–280 Hz fluctuation amplitude of the screaming part (Bretagnolle 1993). Bretagnolle assumed that determination of the sexual affiliation is to be found in the trill part and distinguished between type A (fast rhythm trill), which has a greater number of elements in the trill part, and type B (slow rhythm trill). His data were insufficient to provide evidence of whether females and males show differences in the trill part but he presumed that males produced the faster trill part.

In the present study, the mean time lapse between single trills of the screaming calls given at the nest of three pairs of Common Swifts was calculated. There are significant differences in the trill sequence between individuals, yet those of individual birds are highly constant. Between the two sexes there are clear differences in the trill frequencies. The male always shows the faster trill frequency and a higher modulation frequency in the trill part of the screaming call. When recording the screaming calls of flying Swifts, it has to be recognised that the results may be influenced by a Doppler effect. In general, however, the following limits in the sequence of the trill part of the screaming call can be used for determination of the sex of Common Swifts.

trill part of screaming call	female	male
mean trill lapse time	≥25 ms	≤20 ms
modulation frequency	≤40 Hz	≥50 Hz

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Editorial comment This paper appeared originally in 2015 in the online journal *APUS*life (www.commonswift.org/APUSlife.html). Given that an earlier part of the research into Swift calls was published in *BB* (Kaiser 1997), we felt that it would be interesting to reproduce a summary, and the key results, in this journal. We thank Ulrich Tigges for facilitating this summary. ***Eds***

Obituary

Martin Scott Garner (1964–2016)

Born in January 1964, Martin Garner began watching birds around his home town of Frodsham, Cheshire, in the mid 1970s. He took full advantage of the birding opportunities at Frodsham Marsh, where he found a Long-billed Dowitcher *Limnodromus scolopaceus* in 1979 and followed that up with a Yellow-browed Warbler *Phylloscopus inornatus*, then a real Cheshire rarity, in his Frodsham garden. Together with Bill Morton, his main 'birding buddy' of those early years, he published *The Birds of Frodsham Marsh* in 1987, his first foray into ornithological writing.

Like many others, he progressed through a phase of twitching in his late teens and early twenties, travelling to the extremities of Britain & Ireland to see new species – spending time on Scilly in the rarity-drenched autumn of 1985 was a particular highlight. Unlike most of his contemporaries on the birding scene, he also discovered a deep religious calling in his late teens, and while he will be known to *BB* readers primarily in a birding context, his life was shaped more by his faith and his family than by ornithology.

Martin was commissioned as a member of the Church Army in 1991 and in that same year he and his wife Sharon moved to Luton, in Bedfordshire, where the couple began a new Christian community. In 1996 Martin and Sharon moved to Lisburn, in Northern Ireland, where they continued their missionary work in a hugely challenging situation. Returning to England some five years later, the family settled in Sheffield, and the county of Yorkshire remained home to the Garners for the remainder of Martin's life.

Ornithologically, the move to Luton prompted Martin to focus on one or two particular projects rather than amassing a large list. Landfill sites became a regular birding environment and gulls became a passion, one that he never tired of. Gull-watching in those early years culminated in two landmark papers in *BB* (*Brit. Birds* 90: 25–62, 369–383), on the identification of 'Yellow-legged Gulls',

Anthony McGeehan

168. Martin and a Herring Gull *Larus argentatus* at Belfast dump, 1997.

a name which at that time covered both *Larus michahellis* and *L. cachinnans*. Those papers, with David Quinn and Bob Glover, were a critical step forward in discovering the true British status of what we now call Caspian Gull, and they remain an essential reference to current gull-watchers.

In Northern Ireland, his thirst for gulls was again evident and the discovery of a juvenile 'Thayer's Gull' *Larus (glaucoides) thayeri* at Belfast Dump in March 1997 (written up in *Birding World* 10: 93–100 with Anthony McGeehan) was a major highlight. Some of his other key interests in 'Norn Iron' – 'Grey-bellied Brant', the various races of Common Eider *Somateria mollissima* and the Nearctic race of Shore Lark *Eremophila alpestris* – signposted the way to his favourite birding subjects in later life: obscure, little-known taxa, and other topics that few others were paying attention to. This strategy offered much potential for learning and discovery – two things that were at the heart of Martin's approach to birding.

A combination of his field ability and breadth of knowledge made him a good fit for the Rarities Committee, which he joined in 2006. As a member of BBRC he relished tackling the thorniest problems, and his ability to ask the right questions and follow the evidence formed the basis for two more classic contributions to *BB*. The infamous 1988 '*Chalice* petrel' was analysed with Killian Mullarney in 2004 (*Brit. Birds* 97: 336–345) – their conclusion being that it was most likely to have been a Swinhoe's Petrel *Oceanodroma monorhis* – before Martin's forensic skills were applied in 2005 to the long-controversial 1956 'Fair Isle peep', considered initially to be a Semipalmated Sandpiper *Calidris pusilla*, reidentified as a Western *C. mauri* but now, argued Martin, actually a Semipalmated after all (*Brit. Birds* 98: 356–364).

With the demands of a growing family, Martin resolved to use his birding expertise to add an income to the family budget. He became much more widely known in the birding community in the last decade of his life, perhaps most notably through Birding Frontiers, the website he founded in 2010, and a series of books that he wrote: *Frontiers in Birding* was published by BirdGuides in 2008, before two books in the Challenge Series, *Autumn* in 2014 and *Winter* in 2015, both self-published. Martin also lectured and travelled widely during this period, with Shetland, Arctic Norway and Israel among his most frequently visited destinations. The Yorkshire coast remained close to home and close to his heart, and his role in helping to set up the Spurn Migration Festival was typical of his ability to organise and enthuse others. Martin and Sharon moved to Flamborough in 2013, a location that suited him perfectly, but he died in January 2016 after battling cancer for more than two years. In his last months, he was working furiously on Challenge Series no. 3, devoted solely to gull identification, which we hope will be published posthumously.

Martin Garner had a remarkable talent for encouraging and inspiring others, helping to get the best out of people in any situation (a talent that was central to his work as a missionary). In fact, spending time with him was invariably as much about people as birds. One of his mantras was that the journey was often more important than the destination; his younger brother Simon recalled that during childhood expeditions there was rarely a plan, but that Martin's energy and enthusiasm would more than compensate. He had an ability to communicate that allowed him to deal with seemingly intractable subjects in a straightforward way that everyone could understand. He was the antithesis of a loner; teamwork was a central tenet for all of his books, and the same was true of his Birding Frontiers website. Above all, birding with Martin was fun: a big smile and an infectious laugh were his trademark; he had an ability not to take himself, or birdwatching in general, too seriously (although he was never cynical); and he had an unerring ability to make the best of every birding situation, however unpromising. Martin was one of the brightest lights in British birding and his loss at such a young age will be widely mourned.

Martin is survived by his wife Sharon and their daughters Emily and Abigail.

Roger Riddington and Andy Stoddart

Notes

Prey-attracting behaviour by Little Egret

On 16th August 2015, at Grove Ferry NNR, Kent, I watched a Little Egret *Egretta garzetta* using a novel fishing method. The bird was feeding in a secluded pool, standing in shallow water that just reached its belly. It was generally quite still, watching the surface of the water intently, before it extended its body and neck so that its bill entered the water at a shallow angle until the distal third was just submerged. The bird then began a rapid tongue movement inside the closed bill, apparent from synchronous movements to be seen in the gular area of the throat. The effect of this was to generate a bubbling, spluttering disturbance of the water surface, extending in concentric ripples around the bill. This continued for some seconds until the bird suddenly stabbed into the water and extracted a small fish, which it consumed. The egret repeated the procedure three more times with variable success, before moving a few metres across the pool to repeat the process in a new area. During 30 minutes of observation, the bird changed locality and repeated the process four times, catching several small (unidentified) fish, before eventually walking to a shallower area and preening extensively.

I can find no record of this behaviour in Little Egrets, but it seems to correspond to well-documented behaviour in the Snowy Egret *Egretta thula* (Kushlan 1973; Master 1991). The use of what Kushlan (1973) described as a prey-attracting behaviour suggests that egrets may have been minimising the energetic cost of foraging, such that tongue-flicking Snowy Egrets acquired similar quantities of prey when compared with individuals using other techniques but may have expended less energy in the process. This would also apply to a Little Egret using this technique.

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Red Kites and Common Buzzard following the hay harvest

Many bird species, particularly gulls but also Red Kites *Milvus milvus*, will follow ploughing operations, but on 6th June 2015 I was surprised to see that the latter also follow hay harvesting operations. On a sunny afternoon at Bramley, near Basingstoke in Hampshire, a tractor was cutting grass in a field. From 14.00 to 14.15 hrs, it was followed by three Red Kites, which occasionally swooped down in search of prey, presumably small rodents. At one stage the group was joined by a Common Buzzard *Buteo buteo* but this bird, rather than following, took up positions above the mown crop and hovered before shifting to another vantage point.

Subsequently, I was interested to read the entry for Red Kite in the *Hampshire Bird Report* for 2014 (Clark 2015), which records that 'The largest count anywhere was 79 on June 11th at Stratfield Saye over a field where silage was being cut. Certainly birds do move in on silage operations in large numbers...'. Stratfield Saye is only about 5 km northeast of Bramley.

Prof. Robert A. Cheke, Natural Resources Institute, University of Greenwich at Medway, Central Avenue, Chatham Maritime, Kent ME4 4TB; e-mail r.a.cheke@greenwich.ac.uk

The substantial population of reintroduced Red Kites in north Northamptonshire has learnt to exploit the annual farming activity of haymaking. The process of cutting the

grass for hay unavoidably disturbs insects and kills small mammals, and in so doing provides a food source for the kites. On the morning of 16th June 2015 we had seen up to ten Red Kites taking prey in this way on our Northamptonshire farm. When cutting grass for hay resumed after lunch in a different field, ten kites soon appeared. It is always a thrill to watch the kites swoop down to take food items with their feet, then climb skyward, often trailing clumps of hay picked up unintentionally with a food item.

I was able to capture a sequence of photos of one particular kite as it landed close to a Common Pheasant's *Phasianus colchicus* nest, the hen bird having run away from the approaching tractor. The kite then walked up to the nest, picked up an egg in its bill, and took off, transferring the egg from its bill to its feet. It then proceeded to eat the egg in flight. It returned about three minutes later but this time ate an egg on the ground. This sequence is shown in the accompanying photographs. None of the other kites present showed any interest in the nest.

There does not seem to be a published

Linda Chapman

169–172. A sequence of images of a Red Kite *Milvus milvus* over a newly cut hayfield, taking a Common Pheasant's *Phasianus colchicus* egg (see text for more detail); Northamptonshire, June 2015.

Linda Chapman

173. Red Kite *Milvus milvus* with rodent prey over a newly cut hayfield; Northamptonshire, June 2015.

account of Red Kites feeding in this way in newly cut hayfields, nor of them taking, and eating eggs; it was not mentioned in *BWP* or by Carter (2001).

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Editorial comment Warren (1989) reported kites following the hay harvest in central France; these recent observations suggest that, given the success of reintroduced Red Kites, this behaviour might soon become more frequently observed in Britain.

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Warren, R. B. 1989. Red Kite and Black Kite following mowing-machine. *Brit. Birds* 82: 116.

Unusual Dunnock song

At about 09.30 hrs on 3rd May 2009, I had finished my dawn surveys for Black Redstarts *Phoenicurus ochruros* in the London docklands and was at East India Dock Basin, Isle of Dogs, looking for migrants. I heard an unusual song from what I assumed was a Great Tit *Parus major*. Since I had recently started sound recording birds for my talks and training courses, I thought that it would be good to collect another variant of Great Tit song, and I started to record the singer with a *RememBird* mk I recorder (see fig. 1). When I eventually saw the bird, however, what was in front of me was not a Great Tit but a singing Dunnock *Prunella modularis*. I had not heard this type of song from any Dunnock and am not aware of them mimicking other species. The song was somewhat variable, but in summary like a faster-than-normal and slightly squeaky 'tea-cher' Great Tit song (with or without a terminal flourish that sounded more like it belonged to a Dunnock). The recording is available to listen to at www.xeno-canto.org/146747

The frequency of this odd Dunnock song was between 4 kHz and 6 kHz, which falls within the range for a Great Tit's song, which is typically 2 kHz to 8.5 kHz (that of a typical Dunnock song is from 2.75 kHz to 7.5 kHz).

Then, in June 2010, at Orsett, Essex (around 25 km due west of East India Dock), I heard a very similar song. I was not able to locate the singing bird, but after the song ceased I found a Dunnock in the area where the song was coming from. I have not subsequently heard this song again.

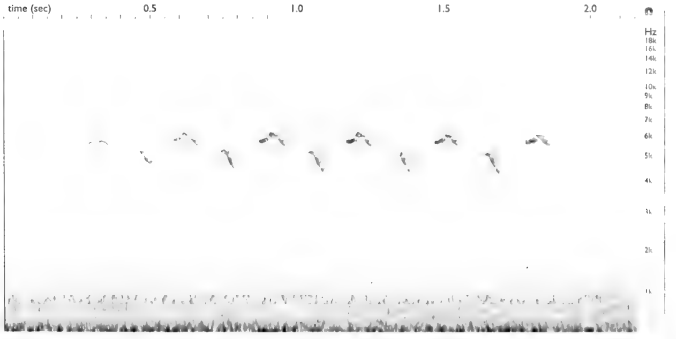
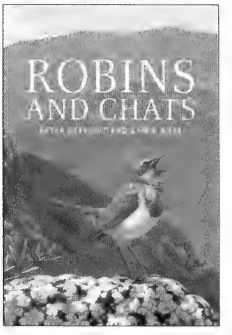


Fig. 1. Sonogram of Dunnock *Prunella modularis* with unusual song, London, May 2009.

David Darrell-Lambert, Suite 11908, 20–22 Wenlock Road, London N1V 7GU;
e-mail david@birdbrainuk.com

Reviews

Robins and Chats



By Peter Clement and Chris Rose
Christopher Helm, 2015
Hbk, 688pp; 62 colour plates, 400 colour photographs
multiple colour figures, b&w line-drawings
ISBN 978-0-7136-3963-6
RRP £60.00, ***BB*** **Bookshop price 54.99**

This new addition to the series of Helm Identification Guides describes 167 species of robins and chats within the family Muscicapidae, and eight species that are now recognised as thrushes (Turdidae). Its scope is worldwide and in general it has done an excellent job at presenting even the relatively poorly known species. The general format will be familiar to most birders – an introduction with explanatory notes, a series of colour plates with key descriptive legends, cross-referenced to the main text, which has range maps and colour photographs. The main text for each species contains the basic information on field identification, similar species, habitat and behaviour, status, and distribution and movements; this is followed by a more formal description including notes on geographic variation, taxonomy, measurements and moult, when such information is available. In addition to the maps and photographs, the main text has line-drawings where appropriate to illustrate key feather tracts – usually spread tails.

It goes without saying that the birds themselves are the stars of the book. I am reluctant to use the term 'bird porn' as it is offensive and rooted in misogyny, but this is an attractive and colourful group of birds. It would easily be possible to spend a few hours poring over the stunning plates and photographs of these species without getting round to 'reading the articles' (as it were). There are species in this book that *BB* readers will be very familiar with, but also attractive and charismatic birds of near-mythical status, and it would be difficult to browse this book without being inspired to get on a plane and try to see some of them. The identification and status text is, in the main, authoritative, with few typos, based primarily on previously published sources. The accuracy of the moult and ageing sections has been called into question elsewhere by Stephen Menzie (see www.stephenmenzie.com/blog/2015/10/2/robins-and-chats), who found significant errors and misleading statements in the text relating to such well-studied species as Robin *Erithacus rubecula*, Common Redstart *Phoenicurus phoenicurus* and Whinchat *Saxicola rubetra*, among others. This inevitably undermines the confidence the reader can have in similar information for the other species in the book.

Taxonomic advances have also played havoc with the preparation of the book. As mentioned above, eight species included here (the bluebirds *Sialia*, cochoas *Cochoa* and Black-breasted Fruithunter *Chlamydochaera jefferyi*) have recently been resolved genetically as thrushes. Conversely other species, such as rock thrushes *Monticola* and some flycatchers, e.g. *Ficedula*, have been confirmed genetically to fall within the scope of this book but are not included. In some respects, therefore, the current volume might best be used as a companion to the previously published *Thrushes*, also by Peter Clement (illustrations by Ren Hathway, published by Christopher Helm in 2000). An excellent introductory chapter by Per Alström explains the recent changes in chat systematics. Lower-level changes in generic assignations have left their mark on the plates, with resurrected and reorganised genera such as *Larvivora*, *Calliope* and *Tarsiger* scattered across several plates and mixed up with each other. It is inevitable that a book of this size takes several years to produce and the authors were left with insoluble problems in relation to the presentation of the plates in light of rapidly changing taxonomy.

It is fair to say that this volume is not without its faults and idiosyncrasies but this should not detract from the appreciation of what a monumental body of work it represents, written with deep knowledge of the subject, carefully and beautifully illustrated. Irrespective of its qualities as an authoritative work of reference, it will be on the birthday lists of many birders in years to come.

Martin Collinson

An Identification Guide to the Ducks of Japan

By Osao and Michiaki Ujihara; Seibundo-shinkosha, 2015
Pbk, 304pp; many colour plates, over 600 photographs, maps
ISBN 978-4-416-71557-4
Japanese Yen 4,980 (Kindle version Yen 3,600)
Available from http://amzn.to/1YzJcwh

Osao and Michiaki Ujihara, father and son, are well known amongst gull enthusiasts for their website on the identification of Siberian and Pacific gulls but have also produced some nicely illustrated books on the identification of gulls and waders. This pocket-sized guide to the ducks of Japan is notable especially for its illustrations. All 43 duck species reported in Japan are covered, plus three expected species. Of these, seven species (including the possibly extinct Crested Shelduck *Tadorna cristata*) originate from Southeast Asia. All the others are of Palearctic and Nearctic origin, many of which also occur in western Europe: in fact, among North American species that have crossed the Atlantic, only Black Duck *Anas rubripes* is missing.

The texts are short, less than two pages per species, and include a few lines on status, followed by a brief outline of each plumage. Nearly three-quarters of the book is devoted to illustrations (Osao has drawn the dabbling ducks and Michiaki the diving ducks), which are extremely accurate, detailing every feather, yet also realistic and elegant: perhaps the most beautiful plates ever for a guide on waterfowl. Almost every species features in at least eight large drawings showing the various plumages and a half page is devoted to birds in flight. In addition, there are 2–3 pages of photographs, with 10–20 images, for each of the main species. Of the 639 photos, all but 40 are taken by the authors, who have been studying ducks in the field for over 30 years. A further section, with a surprising series of 35 photographs, is devoted to gynandromorphy, where the plumage of some females includes male characters. Two chapters deal with hybridisation and include 60 illustrations and 46 photographs.

A testimony to how carefully the Ujiharas have watched their birds is that while paying particular attention to the tertial pattern of dabbling ducks, which differs in the various female-type plumages, they found a unique and easy-to-use criterion to separate Common *Anas crecca* and Green-winged Teals *A. carolinensis* in young and non-breeding female plumage – and as a result, the number of Green-winged Teals reported in Britain should (perhaps) soon increase.

While the text is in Japanese, each species is introduced by its scientific and English names, and the legend for each illustration includes, in addition to male and female symbols, an abbreviation denoting the plumage referred to (e.g. 'br.' for breeding, 'ec.' for eclipse). So this book will certainly be of interest to birders in the west, particularly for the outstanding artwork and as a complement to Reeber's recent *Wildfowl of Europe, Asia and North America*. An e-book version is also available.

Pierre Yésou

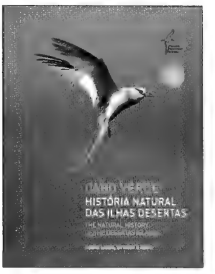
Birdwatching in Northern Greece – a site guide (2nd edition)

By Steve Mills; Birdwing Books, 2011
Pbk, 174pp; many colour photographs, maps and GPS data points
ISBN 978-0-9567770-0-3, ***BB* Bookshop price £25.99 inc p&p**

This is an update to an earlier site guide and it has been extensively revised. This version has updated sections on Lake Kerkini, the Evros Delta, Porto Lagos, Nestos, Lake Ismarida and the Dadia Forest. Additional sites that appear for the first time include the Amvrakikos Gulf, Kalamas Delta, Prespa Lakes and Mount Pangeo. Detailed maps and descriptions of each site are included with GPS references. A current status list for birds of the region, a checklist of birds of Greece and colour photos of the region's key species are featured. All profits from the book are given directly to bird conservation projects in Greece.

Keith Betton

Cape Verde – The Natural History of the Desertas Islands: Santa Luzia, Branco and Raso



Edited by Raquel Vasconcelos, Rui Freitas and Cornelis J. Hazevoet
Sociedade Caboverdiana de Zoologia, 2016
Hbk, 307pp; many colour photos, illustrations and maps, plus CD-ROM in English
ISBN 978-84-60657-93-4, RRP £31.50

This book (in Portuguese – the CD version is in English) is the culmination of a project by the Cape Verdean Zoological Society to study the biological diversity of the Desertas Islands. These are much the smallest islands within the Cape Verde archipelago, situated between São Nicolau and São Vicente. Santa Luzia is the largest, at 35 km², followed by Raso at 7 km² and Branco at just 300 ha. All are now uninhabited and reserved for nature conservation.

Ten chapters describe different aspects of the islands: the geography and geology, the historical impact of human presence (on Santa Luzia), the effects of ocean currents, marine biodiversity, vegetation, terrestrial reptiles and breeding birds. There is a chapter devoted to the Giant Skink *Chioninia coctei*, a species that was endemic to the Desertas Islands but was driven to extinction by over-collecting in the early twentieth century.

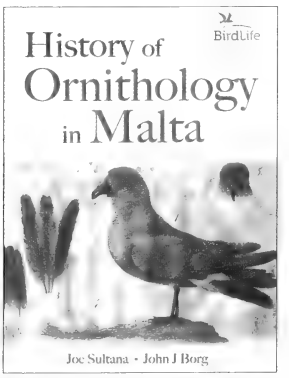
Cornelis Hazevoet has written more than anyone about the birds of the Cape Verde islands and is the obvious choice to author the main chapter about birdlife. The great interest in breeding seabirds is on Raso (six species) and Branco (four species) – Cape Verde Shearwater *Calonectris edwardsii*, 'Boyd's Shearwater' *Puffinus baroli boydi*, Bulwer's Petrel *Bulweria bulwerii*, White-faced Storm-petrel *Pelagodroma marina*, Cape Verde Storm-petrel *Oceanodroma jabejabe*, Red-billed Tropicbird *Phaethon aethereus* and Brown Booby *Sula leucogaster*. There are 11 landbird species, the most notable of which is the endemic Raso Lark *Alauda razae*. Another endemic is the Cape Verde Sparrow *Passer iagoensis*, while strong candidates for future splitting are the local races of Common Kestrel *Falco tinnunculus neglectus* (proposed as Neglected Kestrel), and Barn Owl *Tyto alba detorta*. The challenges facing all of these species are discussed, the seabirds of Raso at least being free of mammalian predators.

Another chapter, by Michael Brooke and Paul Donald, is devoted to the Raso Lark, which is the rarest and most threatened bird of the islands. Numbers have increased in recent years, and a past excess of males over females has largely disappeared. The authors discuss the possibility of establishing a second population, probably on Santa Luzia, which would reduce the risk of some catastrophe on Raso causing the species to become extinct. A final chapter discusses introduced species and conservation measures, bringing together all of the themes discussed earlier.

This book has been the combined effort of 19 internationally recognised experts. Apart from being a great distillation of facts, it is extremely well designed and illustrated. Proceeds of the sales will revert to fellowships that the Cape Verdean Zoological Society will give to students and researchers to study the Desertas Islands.

Keith Betton

History of Ornithology in Malta



By Joe Sultana and John J. Borg; BirdLife Malta, 2015
Hbk, 390pp; many colour illustrations
ISBN 978-99957-818-6-6
RRP €49.99

This book is written by two of Malta's best-known ornithologists: Joe Sultana, who has been at the forefront of the battle between birders and hunters for nearly 50 years, and John Borg, an ecologist who has published many papers on breeding seabirds in particular. For 25 years they have collected papers and other material to document the island's links to ornithology. This book is the result of that effort.

This island of just 316 km², with a popula-

tion of less than half a million people, is full of history. Going back to at least 3,000 BC, the earliest suggestion that the Maltese were aware of birds is a pottery fragment showing a crested species (perhaps a Hoopoe *Upupa epops* or Northern Lapwing *Vanellus vanellus*). There are other examples of birds depicted over many centuries by the Christian Church. Falconry was already popular in the thirteenth century, and by the eighteenth century hunting birds had become a significant source of food for some. The links with hunting remain strong today, but now those who shoot or trap birds do so more for reasons of 'sport' – or the continuation of what they see as a Maltese custom.

What this book shows is that the study of ornithology in Malta really dates back to 1843 when Antonio Schembri wrote the first checklist of the country's birds. Others to have made an impact in those early days include Charles Wright, a 'shotgun ornithologist' who published a paper in *The Ibis* in 1864. There were a number of other nineteenth-century publications and, while these often listed the birds recorded, they also began to recognise the importance of Malta and Gozo as stopover locations for migrant birds. Apart from casual observations, there were also attempts to make regular surveys of migrant birds attracted to three lighthouses. The links between Malta and the British military account for much of the interest through the twentieth century as a number of servicemen were also keen ornithologists. In 1976 David Bannerman and Joseph Vella-Gaffiero summarised everything known up to that date in *Birds of the Maltese Archipelago*, although in many ways this was less authoritative than *A Guide to the Birds of Malta* by Joe Sultana, Charles Gauchi and Mark Beaman published a year earlier. (The latter book was heavily revised in 1982.)

This new book charts the stories behind the work of these ornithologists, with behind-the-scenes accounts of intrigue, debate and a fair bit of rivalry. Photographs of original notes, diaries and correspondence are all included – for example the reaction of David Bannerman to a rather unflattering review of his book in *The Ibis*! The story is brought right up to date with an account of how the Malta Ornithological Society was founded in 1962 and raised the profile of bird conservation while campaigning against hunting. In 1992 this became BirdLife Malta – with 3,000 members today.

This is not the first book to document much of this history – Natalino Fenech covered some of the same ground in 2010 in *A Complete Guide to the Birds of Malta* (*Brit. Birds* 104: 101–102) – but this new book brings together a lot of information in one place in an attractive and readable style.

Keith Betton

Recent reports

Compiled by Barry Nightingale and Harry Hussey

This summary of unchecked reports covers early March to early April 2016.

Headlines With few quality discoveries in this period, it was the long-staying rarities that continued to grab most of the headlines. Topping a shortlist of new rarities were an Oriental Turtle Dove in Kent and a Dark-eyed Junco on the Isle of Man, supported by an Iberian Chiffchaff in Shropshire and a Black-headed Wagtail in Yorkshire, while Suffolk weighed in with a Thayer's Gull and a Lesser Yellowlegs. A spring movement of White-billed Divers off the Scottish coast is now expected; much less so was the appearance of a Gyr Falcon and a Snowy Owl in the same area of Cornwall on consecutive days. In favourable conditions, many of our summer visitors arrived rather early and in good numbers, including Ospreys *Pandion haliaetus*, Sand Martins *Riparia riparia*, Ring Ouzels *Turdus torquatus* and Common Redstarts *Phoenicurus phoenicurus*.

Ross's Goose *Anser rossii* Bathgate (Lothian), 3rd–9th April. Canada Goose *Branta canadensis* Lissadell (Co. Sligo), race *interior*, long-stayer to 19th March. Cackling Goose *Branta hutchinsii* Long-stayers on Islay (Argyll), to 13th March, and at Lissadell to 19th March; Whitrigg (Cumbria), 11th–12th March. American Wigeon *Anas americana* A

Nick Franklin

174. Cackling Goose *Branta h. hutchinsii*, with Pink-footed Geese *Anser brachyrhynchus*, Whitrigg, Cumbria, March 2016. This is the first new arrival following the species' admission to the British List earlier this year (see p. 196); a slew of earlier records have already been accepted by BBRC and will be listed in the annual rarities report in the October issue of *BB*.

widespread mix of new arrivals and long-stayers, in Co. Antrim, Co. Donegal, Highland, Co. Kerry, Co. Leitrim, North-east Scotland, Northumberland, Orkney, Outer Hebrides, Shropshire, Somerset, Sussex and Yorkshire. Ferruginous Duck *Aythya nyroca* Long-stayer in Co. Durham. Lesser Scaup *Aythya affinis* Long-stayers in Cornwall and East Glamorgan; also Lough Skean (Co. Sligo), 18th March to 3rd April. King Eider *Somateria spectabilis* Long-stayers at Ruddon's Point (Fife), to 11th April, Ballyconnell (Co. Sligo), to 20th March, and Wexford Harbour (Co. Wexford), to 7th April. Black Scoter *Melanitta americana* Long-stayer at Rossbeigh (Co. Kerry), to 27th March. Surf Scoter *Melanitta perspicillata* Records from Caernarfonshire (two), Cheshire & Wirral, Co. Clare, Denbighshire, Co. Donegal (nine), Fife, Co. Kerry, Lothian, Co. Louth (five), Scilly, Shetland and Yorkshire. Hooded Merganser *Lophodytes cucullatus* Halesowen, 11th March, then Edgbaston Resr (both West Midlands), 20th March.

Pacific Diver *Gavia pacifica* Marazion/Perranuthnoe (Cornwall), long-stayer to 8th April. White-billed Diver *Gavia adamsii* Skye (Highland), 8th–9th and 14th–15th March; Mellon Udrigle (Highland), 10th March; Lewis (Outer Hebrides), one or two, 14th–24th March, three 4th April; Portsoy (North-east Scotland), two 16th, singles 18th and 28th March; Burghead (Moray & Nairn), 18th March to 8th April; Kingsbarn (Fife), 28th March; Barra (Outer Hebrides), 29th March to 4th April; South Ronaldsay (Orkney), 5th–10th April; Lossiemouth (Moray & Nairn), 7th April.

Cattle Egret *Bubulcus ibis* Long-stayers in Kent, Somerset (probably two), Suffolk and Co. Wexford; presumed new arrivals Cambridgeshire, Devon, Hampshire (two) and Co. Sligo. Purple Heron *Ardea purpurea* Wat Tyler CP (Essex), 6th–9th April. Glossy Ibis *Plegadis falcinellus* Long-stayers Co. Antrim, Co. Carlow, Co. Cork, Devon, Essex, Somerset, Sussex, Co. Waterford and Co. Wexford; presumed new arrivals Ceredigion, Cheshire & Wirral, Co. Cork, Derbyshire, Gwent, Kent, Co. Kerry, Nottinghamshire, Shropshire, Co. Wexford (two) and Yorkshire.

Black Kite *Milvus migrans* Hythe (Kent), 3rd April. Northern Harrier *Circus hudsonius* Long-stayer on North Ronaldsay (Orkney), to 2nd April.

Demoiselle Crane *Grus virgo* One of unknown origin, Mockerkin Tarn/Cockermouth/Eaglesfield (Cumbria), 22nd February to 31st March.

Kentish Plover *Anarhynchus alexandrinus* Dawlish Warren (Devon), 10th April. Hudsonian Whimbrel *Numenius hudsonicus* Marazion/Perranuthnoe, long-stayer to 9th April. Greater Yellowlegs *Tringa*

melanoleuca Whippingham (Isle of Wight), long-stayer to 12th March. Lesser Yellowlegs *Tringa flavipes* Carlton Marshes (Suffolk), 3rd April. Long-billed Dowitcher *Limnodromus scolopaceus* Long-stayers at Keyhaven/Pennington Marshes (Hampshire), to 9th April; Rutland Water (Leicestershire & Rutland), to 6th April; and Cresswell Pond/Druridge Pools (Northumberland) to 10th April. New arrival Sandwich Bay (Kent), 8th–11th April.

Forster's Tern *Sterna forsteri* Kinvarra (Co. Galway), long-stayer to 18th March. Bonaparte's Gull *Chroicocephalus philadelphia* Long-stayers at Dawlish Warren (Devon), to 8th April, and Thurso (Highland), 29th–30th March; also Calvert Lakes (Buckinghamshire), 17th March; Kildavin (Co. Carlow), 18th March; Cardiff Bay Wetlands (East Glamorgan), 5th April. Franklin's Gull *Larus pipixcan* Long-stayer in Cornwall (since January), at Walmsley Sanctuary, 23rd March. American Herring Gull *Larus smithsonianus* Long-stayers Drift Resr (Cornwall), 12th March and 8th April, and Barra (Outer Hebrides), intermittently to 10th April; also Cahermore (Co. Cork), 3rd–4th April. 'Thayer's Gull' *Larus glaucoides thayeri* Minsmere (Suffolk), 27th–28th March. Glaucous-winged Gull *Larus glaucescens* Castletownbere (Co. Cork), long-stayer to 10th April.

Oriental Turtle Dove *Streptopelia orientalis* Otford (Kent), 18th February to end of March. Snowy Owl *Bubo scandiacus* Kenidjack/St Just (Cornwall), 4th April. Alpine Swift *Apus melba* Bolton Ings (Yorkshire), 1st April. Hoopoe *Upupa epops* Ballymacaw (Co. Waterford), 6th–7th April. Gyr Falcon *Falco rusticolus* Long-stayer, North Uist (Outer Hebrides), to 9th April; St Just and Bosullow Common (Cornwall), 3rd April.

Woodchat Shrike *Lanius senator* Lizard (Cornwall), 2nd–5th April. Penduline Tit *Remiz pendulinus* Long-stayers at Saltholme (Cleveland), two, to 28th March; Horsbere Pool (Gloucestershire), two, to 20th March; Titchfield Haven (Hampshire), two to 11th, one to 30th March; and Strumpshaw Fen (Norfolk), to 10th April. New arrival Ashingdon (Essex), 13th–17th March. 'Northern Long-tailed Tit' *Aegithalos c. caudatus* Sandwich Bay, 22nd March; Gorleston-on-Sea (Norfolk), 5th April. Pallas's Leaf Warbler *Phylloscopus proregulus* Portesham (Dorset), long-stayer to 9th April. Iberian Chiffchaff *Phylloscopus ibericus* Telford (Shropshire), 5th–11th April.

Rose-coloured Starling *Pastor roseus* Lizard, long-stayer to 15th March; Land's End (Cornwall), 6th April. 'Black-headed Wagtail' *Motacilla flava feldegg* Swillington Ings (Yorkshire), 9th April. Richard's Pipit *Anthus richardi* Bunmahon (Co. Waterford), 13th March. Arctic Redpoll *Acanthis hornemanni* Fair Isle, 7th–10th April. Dark-eyed Junco *Junco hyemalis* Point of Ayre (Isle of Man), 3rd April. Little Bunting *Emberiza pusilla* Pyrford (Surrey), 13th–31st March.

Notable records of commoner species

Manx Shearwater *Puffinus puffinus* Porthgwarra (Cornwall), 40,000 past on 9th April. Black-tailed Godwit *Limosa limosa* Passage on 13th March included up to 5,000 at Paxton Pits (Cambridgeshire), and 350 at Meadow Lane GP (Bedfordshire). Short-eared Owl *Asio flammeus* Widespread influx in March, mainly ones and twos, but with peaks of seven on the Isle of May (Fife), six at Llanrhidian Marsh (East Glamorgan) and five at Rainham Marshes (Essex/Greater London).

Firecrest *Regulus ignicapilla* Influx in late March and early April, particularly into southeast England. In Kent, at Dungeness, 101 on 26th and 120 on 30th March (a record spring count for the site); Sandwich Bay, eight on 25th; and Margate, 13 on 31st. In Sussex, 13 at Cuckmere Haven on 27th, 12 at Climping on 30th, and ten at Beachy Head on 2nd April. Black Redstart *Phoenicurus ochruros* High wintering numbers augmented by further widespread arrivals from March: high counts included 13 on St Agnes (Scilly) on 15th March, seven at Portland (Dorset) on 31st and eight at Landguard (Suffolk) on 5th April.

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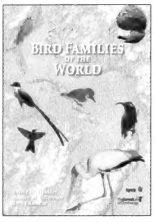

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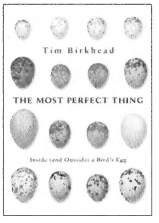

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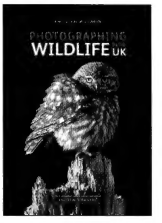

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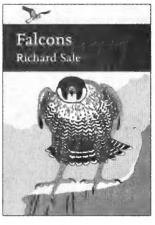

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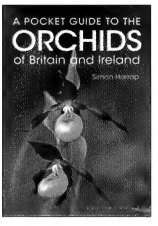

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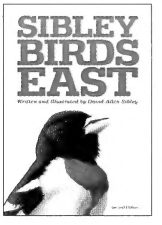

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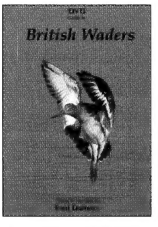

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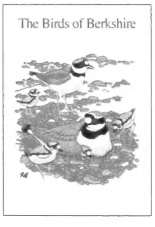

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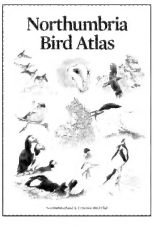

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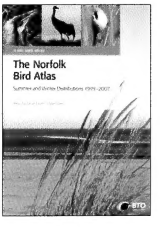

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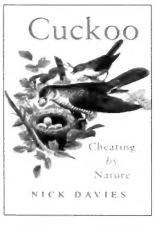

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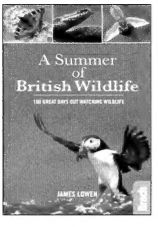

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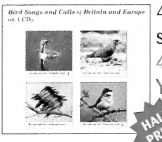

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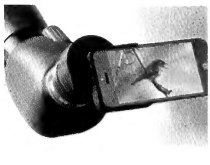

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